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VETERINARY MEDICINE

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D. M. Campbell, Editor A. T. Kinsley, Associate Editor

The dairy cow is the most economic of farm animals in the conversion of farm crops into human food. The hog is second, and the hen third.

Tularemia has recently been identified in Russia. This disease was also recognized in Japan a few months ago, and thus it appears that tularemia is likely a world wide disease.

The presence of a corpus luteum prevents ovulation, produces proliferation of the mammary gland and is responsible for the development of the placental membranes.—Loeb.

Texas has nearly three million angora goats valued at fifteen million dollars. This is a 30% increase in three years. In 1928, over twelve million pounds of mohair was produced in Texas or approximately 80% of the total mohair production in the United States.

Deficiency in vitamines is usually indicated by indigestion, unthriftiness, inappetence, nervousness and probably temporary sterility. Vitamin deficiency has been more frequently reported in poultry and swine than in other animals. Such conditions can be prevented by feeding ample quantities of greens and provision for sunshine. It is claimed that sunshine that passes through glass is not effective.

Urethral calculi are prone to occur in rams and wethers that are fed a ration containing considerable quantities of beets, mangles or other roots.

Tumors, malignant and benign, are relatively common in all domestic animals. Sheep and mules are less frequently affected with new growths than are other animals.

Lymphocytes according to Bergel, secrete a fat splitting enzyme important in fat digestion and in destruction of phagocytized tubercle bacilli.—*Biological Abstracts,* Vol. 1-2-625.

It is now possible to measure the sensitivity of a human to sunburn according to Burt of California. The mechanism and functioning of a living thing is wonderful but step by step the ingenuity of man is unraveling the mysteries.—*Science.*

Organo-therapy has been heralded by a few as a means of combatting a variety of pathologic conditions that may occur in various tissues and organs of the animal body. It is true that the derivatives of the thyroid and the extracts of the pancreas containing insulin have been proved valuable in certain conditions of the thyroid and diabetes. However, many other organo-therapy products are in the experimental stage, some of them may prove valuable.

Approximately 200 distinct species of insects are either directly or indirectly associated with and responsible for the occurrence of disease in man and other animals. It is not possible to accurately estimate the economic loss incident to these pests but it is safe to say that their annual toll amounts to hundreds of millions of dollars.

Our civilization is being made over right before our eyes under the stimulation of the forces set loose by discovery, research and invention. This new physical world has a firm basis upon undeviating universal laws. It is probably true that we have available a mere fragment of the great structure of knowledge which will eventually be brought into the service of man. Our view-points are rapidly changing. Old assumptions, theories and dogmas are being rapidly pushed out of our minds. In this period of mental ferment, shams have been exposed, the taboos of centuries released, and much has been brought up for discussion which was considered settled by our forefathers.—Ray Lyman Wilbur, in *Science,* Vol. LXIX, No. 1790.

Diet is a very important factor in the maintenance of health of not only the human but also domestic animals. Pellagra is of dietary origin or at least the disease can be prevented by reducing the maize and increasing the animal protein in the food. Loin disease in cattle, rickets and osteomalacia are dietary diseases. Improper diet is the primary cause of colic in horses. Digestive derangements induced by improper diet predisposes to a variety of infectious diseases. Thus, hog cholera is more prone to occur in swine that are not provided with a proper ration. Hemorrhagic septicemia is more prone to occur in animals that are not properly nourished. Necrotic enteritis in swine may be a sequel of improper diet and the disease is intensified by solid foods and tankage. Regulation of diet will practically eliminate digestive derangements and will largely diminish the ravages of many infective diseases.

CHANGES AT CORNELL

Veranus Alva Moore for 21 years dean of the New York State Veterinary College at Cornell University, Ithaca, New York, was retired for age, June 21, 1929, and Prof. Pierre A. Fish of the faculty was elected to succeed him.

Dean Moore was born in New York State 70 years ago. He was graduated from Cornell with the degree of B.S. in 1887 and from George Washington University with the degree of M.D. in 1890. The University of Pennsylvania conferred the honorary degree of V.M.D. upon him in 1911 and Syracuse granted him the honorary degree of D.Sc. in 1919. Doctor Moore was in the employ of the Federal Bureau of Animal Industry from 1890 to 1896, succeeding Theobald Smith as chief of the Pathological Division of the B. A. I. in 1895. Resigning from the B. A. I. in 1896 Doctor Moore joined the faculty of the New York Veterinary College first as Professor of Comparative, Bacteriology and Meat Inspection and later (in 1908) became Dean. His published works include: The Pathology and Differential Diagnosis of Infectious Diseases of Animals (1908), Principles of Microbiology (1912), Bovine Tuberculosis and its Control (1913), and a host of articles in U. S. Department of Agriculture bulletins, New York Agricultural Experiment Station bulletins and in Medical and Veterinary journals; his last published article before retirement appearing in VETERINARY MEDICINE less than a week before he retired.

At a dinner tendered the retiring Dean by the New York Veterinary Medical Association, Dr. H. K. Miller of New York City in an address recalled the remarkable development of the veterinary profession during the past quarter-century and of Doctor Moore said:

"No person has had a more conspicuous part in this development than this unassuming man. No man ever made greater sacrifices for the cause of higher veterinary education, or achieved more." He

spoke of Dean Moore's "method of arranging facts, his sense of justice and regard for the opinion of others, his knowledge of the history of veterinary science, and the magnificent mental picture always before him of what his profession should be."

Dr. Cassius Way on the same occasion stated:

"Dean Moore had never been known to miss a single class in all his 33 years of teaching, because of personal disability. We as alumni owe to him a debt which we never can repay, and from which we, our children, and our children's children will benefit," continued the speaker. "There is now before Dr. Moore the greatest opportunity of his lifetime to guide and assist veterinarians in public health work," he added.

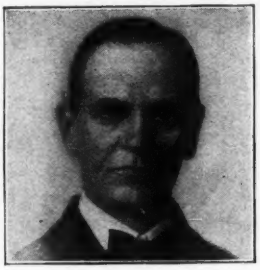
"Dr. Moore belongs to all of us as a valued colleague, counsellor and friend."

Dr. Wm. Reed Blair, on the same occasion said: "He has witnessed a great evolution in veterinary medicine during his term of service. This is the age of the trained man. . . . He has built and guarded the portal to higher veterinary education. We congratulate Cornell University on the prestige which Doctor Moore has brought to it."

The New Dean

Pierre Augustine Fish succeeds at the age of 64 to the Deanship held by Dr. James Law for 40 years and by Dr. V. A. Moore for 21 years; he has however, been in the faculty at Cornell longer than his predecessor, having served the school in various capacities since 1890 with but two interruptions, one 1895-96 when he was employed in the B. A. I., as assistant to Doctor Moore in the Pathological Division, and the other 1918-19 when he was in the army. Doctor Fish was graduated from Cornell with the degree of B.S. in 1890, D.Sc. in 1894 and D.V.M. in 1899. He received the degree D.V.S. from the National Veterinary College in 1906. His published works include: Veterinary Doses, Therapeutic Terms and Prescription Writing (1905), Examination of the Urine of Horse and Man (1906), Exercises in Physiology and numerous articles in veterinary and other scientific journals. He was the first editor of the *Journal of the American Veterinary Medical Association* serving in that capacity 1915-18, and resigning to enter the army.

In 1925 a portrait of Doctor Fish was presented to Cornell University by the



P. A. Fish
Dean of the New York State Veterinary College at Cornell University

alumni of the New York State Veterinary College. On that occasion when accepting the portrait on behalf of the University, President Ferrand said:

"Personal modesty characterizes Dr. Fish. Far from a one-sided man, he is not satisfied with purely academic pursuits, but is alive to the responsibilities of citizenship as well. His enlistment and valuable service during the recent war are adequate proof of this quality.

"It is a great thing for any institution to have visible reminders of the figures who have made the institution great. Among such will stand for all time Dr. Pierre A. Fish, who from the earliest foundations of the college has been instrumental in stamping it with standards and in maintaining those standards, while at the same time attaining notable personal achievement."

The Field of Veterinary Service and the American Veterinary Medical Association*

By T. E. MUNCE, Harrisburg, Pennsylvania

The American Veterinary Medical Association was founded 66 years ago, the objects being:

1. To protect and promote the professional interests of the veterinarian.
2. To elevate the standard of veterinary education.
3. To procure uniform laws and regulations governing veterinary practice and the control of diseases of animals, including poultry.
4. To direct public opinion regarding problems of animals, including poultry hygiene.
5. To promote good fellowship in the profession.

The field of veterinary medicine today is complex and diversified as compared with what it was fifty years, twenty-five years, or even a decade ago. Moreover, everything today is relative.

Less than two score years ago, it was deemed sufficient for veterinary schools to train students for equine practice, and practitioners found this limited knowledge sufficient for the reason that they were seldom called upon to diagnose and treat diseases in the other species of animals.

Today the successful practitioner is not only called concerning diseases in all species of animals, including poultry, but also is consulted by his clients for advice and guidance in matters pertaining to herd and flock management, animal and poultry husbandry, prophylactic measures and sanitation. More than this, practitioners are more frequently being called upon, and rightly so, to assist state and federal regulatory organizations and local Public Health Boards.

The field of veterinary sanitary science and food hygiene has likewise become enlarged and diversified. This branch of veterinary science is no longer confined to a limited amount of food inspection and transmissible disease control work by a few state and federal employes. It has been broadened and organized until today, a fair proportion of the veterinary population are engaged full time in it.

Moreover, the Army Veterinary Corps, as a result of the development and reorganization that took place during the past ten years or so, has been assigned its rightful place in the U. S. Military establishment, and this Corps has been materially widened and developed.

The staff of competent veterinarians carried by practically all of the big milk companies, the up-to-date human disease research foundations, the biological producing concerns, and the best schools of Human Medicine, furnish more evidence of the complex and diversified nature of the field of veterinary science.

This is so for the reason that all species of livestock are becoming highly developed through careful and scientific selection and breeding and thus more valuable. Furthermore, owners have come to recognize the economic importance of disease-free herds and flocks. Moreover, the consuming public is demanding healthful and wholesome animal food products obtained from healthy animals. This development and improvement in the livestock world, and the fact that the public are coming more and more to recognize the intimate relation between certain diseases of animals and those of man, have not only enlarged the field of veterinary practice but have also correspondingly increased the responsibilities of the veterinary profession.

A successful livestock industry is based on three essential things—breeding, management, and health. Veterinarians, by reason of their training should be better equipped than any other class to furnish fundamentally sound, complete and comprehensive advice on these subjects.

* Presented at the Annual Meeting of the Missouri Valley Veterinary Association, Omaha, July 8-10, 1929.

This explains why many of the most successful breeding and dairy establishments are managed by regularly employed veterinarians. It is my belief that many unsuccessful breeding establishments would become successful if they were properly managed by capable veterinarians.

It is a duty and responsibility of us veterinarians to give more attention to the possibilities offered in this field.

Our first duty as individual veterinarians is to be certain that we understand fully and know thoroughly the character of veterinary service needed, then equip ourselves to supply that needed service better than any person else. Veterinarians should do more than this; they should and to their individual advantage familiarize themselves with livestock and poultry conditions outside of disease problems and be prepared and willing to assist in alleviating the things that are detrimental and cause financial loss and discouragement to those industries. In short, veterinarians should take active, sympathetic, and otherwise helpful interest in all livestock and poultry affairs to the end that owners will feel that veterinarians are an integral and indispensable part of their business and that they cannot get along without modern veterinary service and advice.

These statements are not directed to practitioners alone, but apply to practically all members of our profession regardless of the kind or character of veterinary work in which engaged.

To illustrate: If more veterinarians connected with commercial concerns were familiar with and sympathetic toward livestock conditions and needs and were properly concerned in the welfare of the livestock industry, they would discourage, if not prevent, the production and distribution of worthless products.

If all regulatory officials in addition to being technically trained, had practical knowledge and sympathetic understanding concerning livestock problems and needs, there would be fewer instances where impractical, unnecessary restrictions were placed upon owners who are interested and making conscientious effort to establish healthy herds and flocks.

If more veterinarians in public health work had the fundamental training and practical experience of boys who are raised upon the farm, the unnecessarily drastic provisions which exist in some of our municipal milk ordinances would be eliminated and provisions substituted that would afford adequate protection to public health and yet be more easily and willingly complied with by dairymen.

If more practitioners had the understanding concerning the duties, responsibilities, opportunities and possibilities of a local practitioner as does my able predecessor and other modern practitioners, then the general practice of veterinary medicine would be placed more than it is now, upon a universally modern and thus useful and profitable basis and there would also be a better satisfied and more appreciative clientele.

From personal observation and information received from dependable sources, one is led to believe that much, but not all, of the complaint from veterinarians concerning lay competition comes from veterinarians who are either not equipped or are unwilling to render modern veterinary service to all species of animals including poultry.

Mr. A. J. Glover, Editor of Hoard's Dairymen, a close observer in live stock matters and an honorary member of the A. V. M. A., has this to say concerning the present trend and future of veterinary medicine:

"Growth in numbers and value of the live stock industry demand veterinarians of a different training than has been given them in the past. The advent of larger numbers of animals, closer confinement of them and the demand for larger returns create new conditions and demand new practices.

"It is our opinion that the veterinarian of tomorrow must be a thorough student of feeds and feeding and of sanitation. Of course, there will be need for him to be a good practitioner, but this alone will not suffice.

"He must be able to advise as to the needs of all animals for proper growth, production, reproduction and health."

We are living in a new era, when the health and housing of a single hen may mean more to the modern poultry owner

than did the health of the family horse a quarter of a century ago.

I wish to leave the thought with you that the successful veterinarian strives to keep pace with new era methods. The benefits will accrue to those who are in step with the times. Those who cling to past methods will be left behind.

It was proved long ago that individuals in any given field working as such, could accomplish little as compared to what could be done by a number of the same individuals grouping themselves into a well planned organization under able leadership.

This fact was recognized by that group of conscientious and farsighted veterinarians who met over three score years ago and organized our first national veterinary association, which later became the American Veterinary Medical Association, the largest veterinary organization in the world. This wonderful association is what it is today because first, about 4,000 veterinarians in the United States and Canada and their insular possessions have joined and have consistently supported it. Second, because its affairs have been managed and directed by untiring, unselfish, and capable veterinary leadership.

Much could be said concerning the great achievements of the A. V. M. A. in the field of veterinary medicine, and its contributions for the benefit of mankind.

I sometimes wonder what progress the veterinary profession would have made in America if it were not for this organization.

How much stronger and more influential for good could the A. V. M. A. be if all eligible veterinarians in North America belonged to it and supported it.

If, instead of 4,000 members, the A. V. M. A. had 8,000 on its membership roll, how much better could the official Journal be made; also, how much more helpful would be the Secretary's office. With the increased income from the dues of additional members, how much more adequately could the association finance the work of its various committees and activities!

Picture, if you please, two situations. Visualize the profession in North America as it is today; i.e., well organized; the members working harmoniously together. Let danger appear and there will be aroused into action in either our behalf, or in defense of our cause, 4,000 veterinarians throughout the length and breadth of our land.

Picture the profession with no organization, no leadership, just 8,000 individuals working and thinking in terms of the individual. Then let the call come and the reaction, if any, will be that of a mob and not of the well organized and generaled army as at present.

Herds and flocks can best be rendered free from disease and established on a healthy foundation by an organized effort by all interests concerned.

Our profession would not occupy the position it does today in the business, professional or social life of the country were it not for organization. The reason being that the members of our profession could not possibly render the exceedingly efficient and satisfactory service and to the present extent, if it were not that we are organized for that purpose.

Point out a veterinarian who actively participates in the affairs of his school; his local, state and national veterinary association, also in the business, social and religious affairs of his community; and I will show you a successful veterinarian and a leading respected citizen.

On the other hand, point out a veterinarian who is not interested in the things I have mentioned, and I will point to a man who is not as useful and otherwise successful as he might be.

Your national association has to its credit a wonderful record of achievement for the profession. Time will not permit my recounting them. Anyway, I do not feel it necessary to do so for the reason that I have yet to hear of a member who is familiar with the work of the A. V. M. A. and reads the official Journal who would be willing to forfeit his membership in it.

Of course, we here and there run across individuals who are prone to adversely criticize the A. V. M. A. or its officers.

Sometimes the criticism is justified; more often however, it is not and is the result of lack of information on the part of the fault-finder.

Now as to the things the A. V. M. A. is doing for veterinary medicine: At the present time, and this will be of special interest to you, the Association has a committee working on a nation-wide publicity program for the veterinary profession; the purpose being to acquaint the public concerning the character and scope of the work of the veterinary profession and especially as to the variety of veterinary service that members of the profession are equipped and ready to render.

The Committee on Veterinary Biologics is conducting investigations and working diligently in classifying these products in accordance with the A. V. M. A. policy. This committee is working in cooperation with the Federal authorities and the Association of Biological Producers.

The Committee on Proprietary Pharmaceuticals is actively engaged in the work assigned to it. You will be especially interested to know that this committee although but a year old, has already justified its existence in the advice furnished concerning the value of certain cures, or remedies offered the public.

Dr. H. D. Bergman, Chairman of this committee advises me as follows concerning the work of his committee:

"I have been requested by 'Successful Farming' to pass upon an advertising proposition and have been able to develop a very fine relationship with these people. I spent most of the clinic day in Minneapolis in conference with Mr. W. T. Foley of the Webb Publishing Company. He is very anxious to cooperate with our committee. In fact, he wishes to go so far in connection with his report as to indicate that questionable products shall be referred to this committee for decision."

The work of these committees will benefit directly veterinarians and especially general practitioners who are the largest users of biologicals and pharmaceuticals in that they will be kept advised concerning the value, etc., of these various products. I will say in passing that this benefit will accrue to all regardless of membership in the A. V. M. A., which organization not only sponsors and finances this service, but assumes the responsibility, legal and otherwise, for the decisions of the committees.

The Committee on Legislation led the fight to defeat the Bill before the 1928 Congress to increase the Federal Narcotic License fee from $1.00 to $3.00 per year. This one piece of work on the part of this committee means the saving of $2.00 per year to every practicing veterinarian in the U. S., whether or not he is a member of the A. V. M. A.

H. Preston Hoskins
Secretary-Editor of the A. V. M. A.

This committee also assisted materially the Federal B. A. I. veterinarians in procuring more satisfactory classification and salary legislation. This has benefited all salaried veterinarians, and not alone those employed in the B. A. I.

The Committee on Dairy Farm Inspection has performed splendid service in advising and guiding the American Public Health Association, the Association of Certified Milk Commissions, also local health boards, as well as individual veterinarians in matters pertaining to veterinary dairy farm inspection.

Another new committee has within the few months of its existence brought about a satisfactory working arrangement and understanding between the National Humane Society and our profession in relation

to the veterinary activities of the humane societies. This was a situation that had become acute and exceedingly annoying to many veterinarians in certain sections of the country.

Another new feature is the newly created section on Poultry diseases. Furthermore, a special committee on the diseases of poultry was this year appointed and will give attention to this important subject.

The establishment of this new section and committee will tend to encourage and stimulate greater interest among the profession in the diseases of poultry; also will demonstrate to the poultry interests that the profession is interested in and giving attention to the diseases of poultry. And finally a special committee will shortly confer with the administrators of the Smith-Hughes Act at Washington concerning the teaching and attempted practice of veterinary medicine by those affiliated with that branch of the government service.

I have profound faith in the veterinary profession. I am intensely interested in all branches of it and especially the welfare of those engaged in general practice. As evidence of my earnest desire for the A. V. M. A. to do its best and most for them, I have appointed an outstanding general practitioner as a member of the committee on Policy. This important committee, as the name implies, formulates the policies of the A. V. M. A. and by placing a capable practitioner on it, will not only give him a voice in considering and formulating Association Policies, but should encourage practitioners in initiate policies to improve the present ones when indicated.

Moreover, following my election to the Presidency, I resigned as a member of the Executive Board and appointed a successful general practitioner as my successor on this Board. This appointment has given the general practitioners two members on the Executive Board, the largest number they have had in years.

I might continue to tell you about the work done by our national association but what I have mentioned should be sufficient to convince those who have not been following the A. V. M. A. or who have not been interested to the point of joining that this great organization, through its administrative machinery is functioning for the benefit of every veterinarian in North America regardless of the field of practice in which he is engaged. And not only that, there has been drafted a comprehensive, constructive and forward-looking working program for the guidance of the officers and members during the current year. This program will embrace: First, a publicity campaign to acquaint the public concerning veterinary medicine; Second, a comprehensive up-to-date program of veterinary education to be drafted by men with modern ideas on the subjects; Third, moving the offices of the Secretary-Editor to a more accessible point and thus enable the association to function to better advantage and be more helpful to the profession; Fourth, the bringing about in the sections needed of a better understanding and more friendly cooperation between agricultural teachers and extension men, regulatory workers, and general practitioners; Fifth, a closer affiliation between the various state associations and the A. V. M. A.; Sixth, the strengthening, where indicated, of every department of the Administrative machinery of the Association to the end that we may have a bigger, better and a more helpful A. V. M. A.

I call upon all veterinarians and others interested in the welfare of our profession to assist in the development of this program.

The A. V. M. A. has made wonderful progress and its achievements have been momentous. The leadership displayed and the effective and arduous work done in the ranks, could not be excelled.

The A. V. M. A. is so organized and functioning as to be of assistance in every phase of veterinary medicine; moreover, it is awake to any condition that in any way involves or affects the veterinary profession.

I have no criticism to make but only praise to give for all that has been accomplished up to the present time. My job as President is to think and plan for advancing the A. V. M. A. and Veterinary Medicine. Even if time permitted, I would not attempt to picture to you for I could not, what the future has in store for Veterinary

Medicine. I am sure that it will not always be as it is today. I am confident that in the not distant future, I cannot say how soon, Veterinary Medicine will be practiced on a more scientific and broader basis than at present. Veterinarians of the future will have a larger vision of the opportunities for their profession, a better conception of the relationship their profession bears on the other professions, and the business interests they would or should assist or serve. In the words of Dean Moore:

"Veterinarians must come to understand that veterinary medicine is a profession created to render service and to make possible a successful animal husbandry; that its practice involves intelligent and strict application of scientific laws; that veterinarians should be leaders in all matters pertaining to health and disease of animals, and that anything outside of earnest effort to render a conscientious and faithful service is unworthy of the profession."

Mr. E. S. Bayard, Editor of Pennsylvania Farmer, himself a breeder of pure-bred live stock and an honorary member of the A. V. M. A., has this to say:

"You realize, I am sure, the broader basis for modern veterinary practice. It is no longer a one-animal practice. All this requires not merely broader education and study on the part of the doctor of veterinary medicine, but it requires that he shall be a bigger man in every respect."

And again quoting Editor Glover:

"Our live stock interests are of greater importance now than at any period in our history and they will continue to grow in importance for many years to come. This demands better trained men to treat ailing animals and to give owners proper directions concerning the care and feeding of their herds and flocks, also disease prevention and sanitation.

In short, Veterinary Medicine of the future will be more thorough and more comprehensive than it is today. It must be so, for it is impossible for individuals, professions, or businesses to progress without changes of method to conform to the spirit, needs, and customs of the times. All this will be brought about through the energy and initiative of the profession itself.

The A. V. M. A. needs and deserves the active interest and unstinted support of every veterinarian in North America. If this support is given, then point five of our current working program; namely, a bigger, better, and more helpful A. V. M. A. will be assured.

If you are not a member, this great organization just the same is helping you and I am sure that no veterinarian would knowingly continue to be the recipient of the A. V. M. A. assistance without contributing to its support, and I now appeal to every eligible veterinarian in the Missouri Valley who is not a member of the A. V. M. A. to join, and after joining, to take an active interest in Association affairs. This appeal is made solely in the interest of the individual veterinarian and the noble profession to which we belong. The A. V. M. A. needs the non-member and he needs it. One is essential to the welfare and success of the other. And what I have said concerning membership in and support of the A. V. M. A. applies also to your state associations. Every eligible veterinarian in this great live stock producing area should also belong to and actively support his state asociation.

Hyperkinesia—Running Fits

By WILLIAM LINTZ, M. D., Brooklyn, New York
Late Clinical Professor of Medicine at Long Island College Hospital. Senior Attending Physician of Unity Hospital. Consulting Physician of Shore Road Hospital, etc.
and GERTRUDE LINTZ, Brooklyn, New York

Definition

WE PROPOSE the term "Hyperkinesia" (Hyper—a prefix signifying above, beyond: Kinesia—or Kinetia—meaning motion-sickness), instead of "Running Fits" for this disease, because we believe the latter is an abusive terminology for any disease.

Introduction

The disease we are about to describe is not really a new disease, in the sense that it has only recently made its appearance, but it is new in the sense that it has not been recognized by the veterinary profession (with few exceptions) as a disease entity, and there is no mention of it in veterinary text books. We have seen the disease for the last four or five years amongst all kinds of dogs, although of late it seems to be more prevalent and particularly more virulent. It is exceedingly contagious and occurs in epidemics, is commoner in summer than in winter. Hot weather affects the disease unfavorably.

This report must be regarded as a preliminary one. The study is not by any means final or conclusive. At the same time it is but just to say that it represents the conclusions from four years of continuous, painstaking research of one who has behind him more than 25 years' experience in research work.

The material gathered for this research work has been taken from one of the largest kennels of St. Bernard dogs in the world (Hercuveen Kennel). About 200 dogs have been lost from this disease.

The chief symptoms lie in the gastro-intestinal tract and the nervous system. Entire kennels have been known to be wiped out in a very short time, so disastrous is the result.

Prominent veterinarians are baffled when consulted regarding this malady. Some of them will admit honestly they do not know what it is. Most of them believe it is only a syndrome and not a disease entity, and they ascribe the symptoms to irregular and improper feeding, resulting in a lack of vitamins, sun stroke—botulism—rabies—lead poisoning—disease due to fright—running fits—hook worm disease, and other intestinal parasites, coccidiosis, epilepsy and distemper—its complication and sequellae, rickets and teething.

That it is a definite disease we have proved conclusively, not only by the exclusion of the other diseases and *particularly by the above mentioned factors,* but by the fact that we have been definitely able to inoculate healthy dogs with the blood taken from the diseased animals and very promptly reproduce the disease in healthy dogs. We have also been able to reproduce the disease by a certain germ obtained from the heart blood of an infected animal, by inoculating a healthy dog and then isolating the original germ. This part of the work we will describe later.

This ailment not only affects grown dogs, but is particularly virulent to puppies. In fact, a kennel infected with this disorder is unable to raise puppies, under any condition. They all die, if not during lactation, then certainly after lactation ceases. Even before this, we note that the bitches rarely breed, and if they do conceive, abortions are frequent as well as premature labors. Should living puppies be delivered, they are poor doers. They are small, puny, weak, and have to be coaxed to nurse. Many of them

remain definitely small in stature, should they recover.

It is to be noted that infection not only is spread from animal to animal, but is carried by intermediaries, such as attendants, eating utensils, etc.

Symptomatology

The incubation period of the disease has not been definitely determined. It appears to be anywhere from a few days to several weeks, but one cannot make a positive statement in this regard. The average period is about two weeks. The disease exists in two forms: (1) The Acute, and (2) The Chronic.

Symtoms in the Acute Type

Gastro-Intestinal Tract.—The earliest sign appears to be the refusal of the animal to eat. This may vary from a partial to complete anorexia. A capricious appetite is also noted. Very often the animal will eat raw or cooked meats, whereas he will refuse all other foodstuffs. If mixed with other foods he will always pick out the particles of meat. There is a peculiar odor to the breath, which is characteristic.

The teeth, especially the back ones, in all dogs, become definitely discolored with a dirty yellowish film, which persists for a long time after the disease has terminated. A sure sign that the dog has completely recovered is the return of the normal color to the teeth. The gums show a reddish purple line above the juncture of the teeth and gums. This is more marked in the upper than the lower jaw. The tongue is clean but of a bluish tinge, thickened along the edge and indented by the side of the teeth. The pharynx is congested. There is no difficulty in deglutition.

Vomiting is an early and definite symptom, at first occurring only after feeding; but later there is continuous retching and even water is vomited. The vomitus is offensive and consists of the stomach contents with much mucus. Another exceedingly conspicuous symptom is great thirst. Animals (St. Bernards) have actually been known to drink nine to ten gallons of water in twenty-four hours, retain it for a few minutes, then vomit it up again. There is, however, no distention of the abdomen.

Diarrhea is an important factor in connection with this malady. The stool appears distinctly black and frequently towards the end of the disease, pure dark blood is passed. The loose black bowel movements contain occult blood in large quantities. The stool contains a great deal of mucus and is offensive in odor. A notable factor is that the animal keeps its abdominal walls tense and contracts and arches its back.

Circulatory System.—The dog at times becomes inactive with definite limited movement. The mucus membrane, especially the buccal, turns pale and cyanosed. The tongue may be bluish to a decided black in the final stages. No edema is in evidence. Marked tachycardia as high as 200 is seen.

Respiratory Tract.—There is no nasal discharge, no cough, no respiratory symptoms, to be seen. Exception: Some animals show a slight cough.

Genito-Urinary System.—The genito-urinary system is decidedly negative, there being no increased frequency, no change of color, no polyuria, no dysuria, etc., and a negative urine examination is found.

Metabolic.—There is a decided loss of weight but no involvement of bones, joints, or muscles, in the acute form.

Nervous System.—The intensive disturbance of the nervous system is the conspicuous characteristic of this disease. The animal is irritable and very apprehensive; he is busy and on the *qui vive* all the time, pacing furtively up and down with ears pricked up as though looking for trouble. His special sense organs seem to be particularly sensitive. Bright lights, strange or harsh sounds, unusual odors, an unexpected touch, especially about the head, seems to start an attack. The onset generally occurs in the morning or at night before feeding time, although they may occur at any time. The animal suddenly rouses, the ears flattened against the skull and assumes a wild and apprehensive look, then begins to howl in a strange, unnatural voice, at the same time pacing madly up and down or, apparently terrorized, seeks a hiding place. He now

begins to sway his head from side to side, at the same time clicking his jaws. If unaccustomed to seeing them in this state, one would think them vicious and apt to bite, but they are harmless and more frightened than to be feared. Only occasionally, however, will the animal bite. The animal finally collapses in tonic spasms, particularly of the extremities, abdominal muscles and the muscles of the back. Clonic convulsions may take place but they are not as frequent. Respiration is hard and labored and the heart beat rapid. The eyes become dull and the pupils markedly dilated. The mucus membranes become cyanosed or even black. The animal may die in one of these attacks, in which case death seems to be mainly from asphyxiation rather than any other cause. Usually after two or three minutes he comes out of the paroxysm, being weak, dazed and stuporous, particularly in his hind extremities, which at first glance might be mistaken for paralysis, but after several hours or days, as the case may be, he pulls himself together as though nothing had happened, or he may go from one spasm to the other upon the slightest provocation which would excite his auditory, optic or olfactory apparatus. He may have several of these spasms and yet recover.

These "running fits," although present in the great majority of cases, in rare instances may be utterly absent even in fatal cases. The digestive symptoms are never absent. Occasionally there is an atrophy, weakness or slight paralysis of the hind extremities.

The skin and coat are not affected. There is no discharge from the eyes, but a strabismus, especially upper and hypertrophic conjunctivitis, are present. Ears and nose are negative. As a rule the temperature is low, normal or subnormal. It may range from 102 deg. F. to 104 deg. F. at the onset. After four or five days, the temperature reaches about normal and remains so throughout the course of the disease. A subnormal or normal temperature is not by any means infrequent.

The duration usually is from four to six weeks. If the malady ends in recovery, the gastro-intestinal symptoms disappear, the appetite returns and the nervous symptoms vanish to such an extent that the animal appears normal. In most cases, however, the animal is irritable and apprehensive for a long time.

Strange to say, though the animal may be apparently fully recovered for a month, should another animal have a spasm, the recently recovered animal may be subject to a recurrence of the spasm, even to the black bowel movement. They evidently harbor this disease for some time in a quiescent stage. Although recurrence is rare, it may take place.

Undoubtedly all breeds are affected. We have observed it amongst St. Bernards, Terriers, Chows, Old English Sheep Dogs, Police Dogs, Irish Setters, Mongrels, Pekingese, Pomeranians, and other breeds.

Complications such as pneumonia, intestinal and subcutaneous hemorrhages, ulcerations, keratitis, and suppuration of the eyes are fairly frequent in this disease.

Symptoms in the Chronic Type

There is also a chronic form of this disease which manifests itself by the animal going through the acute form as described, but instead of fully recovering, they become unthrifty, poor doers, the skin showing rashes, especially pustules, loss of coat, dull eyes and discharge, an exceedingly irritable nervous system and subject to convulsions on the slightest provocation. Young animals are stunted in growth and frequently show an atrophy of the muscles of the hind extremities. Osteomalacia and other skeletal changes are a frequent sequellae. The prognosis in the chronic form is very poor.

Discussion

As many veterinarians believe that this is only a symptom caused by *intestinal parasites,* especially hook-worm, whip-worm and tape-worm, we can state that of the numerous autopsies performed, only three dogs showed worms, and they were hook-worms, whip-worms, and one had in her heart *Filaria sanguinis caninae*. The reason for such a low percentage of intestinal parasitic infection is due to the fact that this known factor was rigidly excluded by the proper and usual treatment employed, to eradicate

intestinal parasites. From this brief but conclusive statement, we can positively exclude intestinal parasites as a factor in this disease.

Diet.—These dogs were fed on fresh beef, bones, milk, and cooked and raw vegetables, cereals such as shredded wheat, toasted bread and raw eggs. The puppies all received cod-liver oil. No proprietary foods, such as dog biscuits, have been given. They have been fed regularly twice daily. From this brief description food can be excluded as an etiological factor. There is no lack of the proper vitamines, no rickets and no indigestion. They lived in the open.

Lead Poisoning.—Lead poisoning from eating paint has been suggested by a prominent veterinarian. That lead does attack the nervous system, the blood and the gastro-intestinal tract, the three systems so conspicuously involved in this disease, is well known. However, with one exception, in plumbism there is marked obstipation, whereas in this disease, the opposite prevails, diarrhea was a marked symptom. In spite of this very painstaking research, studies were made on the blood and with the exception of a marked secondary anemia, no stippling of the red blood cells was found.

Sun-Stroke.—While it is true that this disease is more severe and prevalent in hot than in cold weather, it is equally true that it does occur also in cold weather, therefore it can not be due to sun-stroke. The highest known temperatures occur in sun-stroke.

Rabies.—While no uniform examination of the brain for Negri bodies was performed, in the few brains examined no Negri bodies were found. The symptoms, history, course and outcome eliminate rabies.

Epilepsy.—Epilepsy is not associated with persistent howling, and why should it spread through the entire kennels and lead to so many fatalities?

Distemper.—This disease occurs not only in puppies, but also in adults who have already had distemper. The same holds good for teething.

Pathology

While the autopsy findings varied somewhat in the various animals, depending upon the duration of the disease and whether it dies in convulsions or the interim, in the main, however, the pathology was quite uniform. The muscles and the osseous system and the joints were all negative.

Heart.—The heart was of normal size. The myocardium was of good condition. The endocardium and the valves were not affected. A fibrinous pericarditis was occasionally found as well as an organized clot in the auricles, which quite frequently extended for some distance in the pulmonary blood vessels. The big blood vessel was negative.

Lungs.—If the animal died during a convulsion, the lungs showed all the signs of asphyxiation. They were blackish in color, atelectatic or very poorly aerated and markedly congested. Otherwise, if the animal dies during the interim, the lungs are negative.

The most important complication was pneumonia in its lobar or broncho-pneumonic form. The pleural cavities were negative.

Digestive System.—The tongue, the esophagus, the stomach and the small and large intestines, were as a rule, negative. Very frequently we found, however, submucous hemorrhages of variable size, and occasionally an ulcer was present.

Parasites were found in only three of the cases autopsied. They were hook-worm and whip-worm and one of the cases showed *Filaria sanguinis caninae.*

Spleen.—Was somewhat enlarged.

Pancreas.—Was normal.

Liver.—The liver as a rule was friable and soft, much enlarged and very much congested; very granular on section and the markings indistinct.

Kidneys.—These organs as a rule were negative.

Nervous System.—Cerebro-spinal fluid was perfectly clear; as a rule somewhat increased in pressure and of normal cytology and chemistry.

The brain and cord and meninges showed numerous minute petechial hemorrhages throughout.

Numerous blood examinations were made

and they showed a slight lymphocytosis. There was no polymorphonucleosis. There was no increase in the leucocytes, otherwise the white blood count was normal. The red blood cells showed a marked secondary anemia present as a rule. Normoblasts and even megaloblasts were occasionally found as well as anisocytosis, poikilocytosis, polychromatophilia. The typical differential count is as follows:

1.		2.		3.	
Poly	34	Polys.	66	Polys.	73
S. L.	16	S. L.	31	S. L.	18
L. L.	 0	L. L.	 1	L. L.	18
Eos.	 0	Eos.	 2	Eos.	 5
Bas.	 0	Bas.	 0	Bas.	 0

Moderate Number of Anemic Red Cells

Urine.—The urine as a rule is entirely negative.

Feces.—The feces as a rule is dark brown to a jet black in color, diarrheal in consistency, foul odor and contains a great deal of mucus, very often macroscopic and invariably microscopic blood is found.

Experimental Research Work

Having made sure that this was not merely a symptom of the conditions previously enumerated, we now attempted to determine if this was a definite disease. After making sure the animal was healthy in every respect, a mongrel dog weighing about nine pounds was inoculated with the blood of a dog suffering from this disease. As we were unaware how this disease was communicated, 5cc of blood was inoculated in the jugular vein and another 5cc intra peritoneally. He was kept under absolute isolation, using as a control a normal police puppy. Within twenty-four hours the mongrel developed the disease and the police puppy which did not have the disease previously, developed it subsequently, when kept in contact with the infected animal.

The black mongrel began with anorexia, black diarrheal bowel movements and vomiting. Three days later he showed the involvement of the nervous system, by howling, yelping and attempting to scale the wall and hide. This lasted about one-half hour, when he went into tetanic convulsions of the extremities and clonic convulsions of the lower jaw, with marked retraction, opisthotonos, loss of control of the urinary spincter and unconsciousness. This also lasted about one-half hour. While unconscious there is a marked dilation and glazing of the pupils.

When the convulsions ceased the animal went limp, became confused and amaurosis was present. Gradually the animal regained muscular tone, but there remained a complete paralysis of the hind extremities from which he never completely recovered, although he improved considerably. He lived for four weeks and then died. During the last weeks emaciation was a marked symptom. He had spells of howling and yelping with convulsions occurring quite frequently, especially upon excitation of his auditory, olfactory and optic apparatus. His temperature as a rule was normal or slightly sub-normal, never above 102½° F.

It was surprising how well the dog could get about in spite of his paralyzed extremities, by pulling himself along with his fore feet.

He died four weeks after the inoculation in a state of coma and he was immediately autopsied.

Autopsy

Autopsy showed as follows:

Profound emaciation. Rigor mortis marked.

Eyes sunken and greyish white in appearance, cloudy and showing a definite keratitis, the left eye being the more involved.

The brain and cord were exposed and showed markedly injected meninges and minute hemorrhages throughout their substance — both cortex and medulla.

Parotid glands were normal.

The thorax contained no fluid.

The heart was slightly dilated; pericardium smooth, without exudate; heart muscle normal. An organized clot filled the entire left ventricle. The mitral valves showed no pathology. Left auricle was normal; right contained fresh clot which filled entire auricle—the same was found in the ventricle.

The tricuspid valves were normal.

The lungs showed hemorrhagic spots throughout the entire lungs. Areas of broncho-pneumonia were present. The trachea was normal.

The bronchi contained a small amount of white-

yellowish exudate. The bronchial lymph nodes were not involved.

The abdomen contained no free fluid. The great omentum had all its fat absorbed. There was no enlargement of the abdominal glands.

The spleen hard, firm and not enlarged. On section the markings were obscure and the parenchyma friable.

The liver appeared to be normal in size and on section markedly congested and friable.

Both kidneys showed large greyish spots throughout, which when cut into showed to be infiltrating the kidney substance. No free pus was present. The spots extended through the entire substance of the kidney from the cortex to the medulla. They varied in size from millet seed to one quarter of an inch in diameter. Pelvis of the kidney normal; ureters also normal; no enlargement of the kidneys. Markings were very distinct. There were no hemorrhagic areas. The capsule stripped easily.

The adrenal glands were normal in size and on sectioning.

The gall-bladder appeared normal.

The stomach was filled with undigested food; there was no distention. The mucosa of the stomach was normal, no hemorrhages present.

A thorough examination of the entire intestinal tract proved normal with the exception of the transverse colon, which showed subcutaneous hemorrhages throughout the entire mucosa. The whole intestine was covered by thick mucous.

A thorough examination of the feces revealed no ova or parasites.

The appendix is kinked but normal.

The pancreas were normal.

A normal bicornate uterus was present; ovaries normal.

The joints of the extremities were opened but no pathology could be found.

Microscopic Examination

Heart muscle—Edema and cloudy swelling only.

Lung—Lobular pneumonia.

Kidney—Multiple abscesses.

Spleen—A subacute splenitis with reticular hyperplasia, moderate fibrosis, and containing large numbers of phagocytic cells laden with hemosiderin.

The stomach and intestinal mucosa normal except for post-mortem changes and separation of the epithelial layer (artifact).

The pancreas and adrenals normal.

Sections from the cord and brain showed hemorrhagic areas.

A terminal broncho pneumonia was the immediate cause of death, a not at all infrequent condition.

Spinal Fluid—Under strict aseptic precautions a cisternal puncture was made upon the death of the animal. 6cc of clear fluid was obtained, under moderate pressure. Toward the end of aspiration a drop of blood was obtained. The spinal fluid showed a trace of albumen, no sugar, and microscopically showed an occasional lymphocyte and a number of red cells. *Gram stain* of sediment showed Gram-negative diplo-bacilli and in short chains, an occasional lymphocyte and many red cells. *Jenners stain* showed the same. The diplo-bacilli in some areas resembled cocci.

Typical Blood Counts—A reduction in the red cells and a marked anemia was a frequent finding as well as normoblasts, anisocytosis, poikilocytosis and polychromatophilia. The white cells were normal in number.

Bacteriology

Numerous cultures were made from the blood, brain, cord, spinal fluid and every tissue and organ of the bodies of these dogs. The most constant finding was a gram-negative motile bacillus, the proteos hydrophilus, which is described in detail below. Dr. Gillman, who has also been working on the same subject first drew my attention to this bacillus. In a small number of dogs I isolated a Gram-positive diplococcus as well. But while I could readily reproduce the disease and fulfill my four postulates of Koch with the bacillus, I could not do it with the diplococcus. (B)

Cultural Characteristics (c)

Bacillus hydrophilum fuscus			
–	Endospores		
+	Flagella		
–	Gram Stain (4)		
+++	Free Oxygen Required (5)		
+	Indol formed		
....	H S formed		
+	Nitrates Reduced		
+	Gelatin liquified		Milk
+	Coagulated		Milk
–	Peptonized		Milk
AG	Dextrose (glucose)		Carbohydrate fermentation (6)
A	Lactose		Carbohydrate fermentation (6)
AG	Sucrose (saccharose)		Carbohydrate fermentation (6)
....	Maltose		Carbohydrate fermentation (6)
AG	Manitol (mannite)		Carbohydrate fermentation (6)
....	Salicin		Carbohydrate fermentation (6)
....	Inulin		Carbohydrate fermentation (6)
D	Slant	Russel's dextrose lactose anradi	Carbohydrate fermentation (6)
A G	Butt	Russel's dextrose lactose anradi	Carbohydrate fermentation (6)

(*Chart continued on next page*)

....	Specific extoxin		(7) Poisons
....	Hemolysin or other lysins		
....	Leucocydin		
....	Endotoxin		(8) Antibodies
....	Antitoxin		
....	Types	agglutinins	
....	Heterogenous		
....	Bacterocidin		
....	Opsonin		
d	Skin & Subcutis		Pathogenicity, according to site
d	Mouth & nasopharynx		
... ...	Gastro-intestinal tract & Peritoneum		
d	Resp. tract & Pleura		
... ...	Eye		
... ...	Ear		Names & lesions & diseases produced indicated under site (see key)
... ...	Nervous system		
... ...	Genital tract		
... ...	Urinary tract		
O [2]	Circulatory system & Pericardium		
O ...	Lymphatic system		
... ...	Bones & Joints		
d	Liver & Pancreas		

KEY

4. Gram's stain varies with age of culture and kind of culture medium. Unless indicated in notes these bacteria take ordinary stains as well and the usual spore and flagella stain.

5. In this column, means aerobic and facultative anaerobic, means micro-aerophilic, and means anaerobic.

6. Carbohydrate fermentations are notoriously subject to variations, according to composition, reaction and method of sterilization of media, upon supply of oxygen, purity of sugars, etc. They may or may not be in accord with serum reactions. Investigators frequently have not agreed as to results. In these columns A means acid and G means gas.

7. Too little has been done on bacteriophage and certain other poisons and antigens of bacteria to include them in this table.

8. Precipitins are not included because they are of too general a character.

KEY TO NAMES OF CHIEF LESIONS AND DISEASES PRODUCED BY BACTERIA

A. INFLAMATION (3)

1. According to exudate.
   (a) Mucous catarrhal
   (b) Serous
   (c) Purulent
   (d) Hemorrhagic

2. Named according to conveyance through blood and lymph channels.
   (n) Toxemia
   (o) Septicemia
   (p) Pyemia (Bacteria may produce septic thrombosis).

(3) Inflammation is the vascular and cellular response of an individual to an injury. It is a defensive process, therefore when possible merges quickly into repair.

Treatment

We have found the following regime conducive for best results.

A—Prophylaxis.—1. Avoid all contact with this disease; be particularly on the lookout for infection during breeding season. Admit no dog in your kennel, that has the disease, or even if he is free from the disease, if it comes from a kennel where this disease is prevalent.

2. Institute complete and strict isolation the moment the disease is discovered.

3. Remember that stray dogs may be the source of infection.

4. Vaccines—We believe that immunization with vaccines will prove to be the most efficient and practical means of preventing this malady.

B—Active.—1. Place the affected animal in dark quiet place and avoid all stimuli reaching the sensorium through the special sense organs, particularly through sight, hearing, smell and touch.

2. Avoid over feeding—give milk, eggs and finely chopped meat.

3. For the diarrhea give large doses of bismuth.

4. Keep the dogs drowsy, and thus avoid "running fits," by administering phenobarbital gr. $\sqrt{}$, two times daily (for St. Bernards).

5. Give cardiac stimulants where indicated.

6. For "running fits" give no morphin hypodermically, but give chloroform.

7. Asphyxiation as the result of tonic and clonic spasms of the respiratory muscles is the real danger in this disease and the most frequent cause of death; we propose Alpha Lobellin—in lcc hypodermic injections repeated as necessary as the very best respiratory stimulant for this condition.

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(C) Insert Chart: (after Park and Williams).

Immunizing Silver Foxes Against Lungworms and Associated Infections

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LUNGWORMS in silver foxes have been more or less of a serious problem to raisers of silver foxes. The mention of using a bacterin in immunizing foxes against lungworms seems on the face of things an absurdity. However, during the past year in the course of investigations several new factors have been uncovered which have made the method not only of possible but of practical value. The writer, therefore, presents the results of his investigations during the past year.

The lungworm of foxes is a slender white thread-like worm 1½ to 2½ inches long. Its habitat is principally the trachea and its branches. Here these worms lie covered with mucus and pus, which affords them protection and which is impervious to fumes, gases or liquids.

Usually pups become infested first, showing a wheeze and rattle. Some of the pups overcome the parasitism, while others either die or the infestation may develop into a chronic stage and persist for several years. The health of the fox is impaired with a resulting lowered vitality and diminished production.

Up to two years ago no method was effective in killing or removing the worms. Gases and fumes were ineffective, doing more damage than good to the tender tissues while liquids often produced mechanical pneumonia. The situation on some ranches was so serious the breeders considered it hopeless.

Two developments in the past two years have helped to some extent to control the disease. The tracheal swab developed by the writer has given fair results in many cases, and is now extensively used on many ranches. Another aid to the control of lungworms in foxes is good feeding, sanitation and changing to new ground or placing the animals on floors of screening. However, it has not been proved to the satisfaction of all that infestation takes place directly from the worm eggs. There is a possibility of an intermediate host that transmits the disease.

It was found that the mechanical action of the tracheal swab removed 40 per cent or more of the worms present.

Dr. Hanson of the U. S. Experiment Station states that this portion of the worms are usually present in the trachea, and 60 per cent are in the smaller bronchi, and, as the worms mature, many work up into the trachea to deposit their eggs, so that a second swabbing gets a large percentage of what is left after the first swabbing.

Although this treatment seemed to get many of the worms, and effect a cure in a number of cases, it frequently was not entirely successful, especially in adult chronic cases. A cough and wheeze often persists when only a few worms are present. It became evident that something else was needed to effect a complete and permanent cure, and a study of the situation was made with the cooperation of a number of ranches. Many specimens were secured of foxes infested with lungworms.

During the course of the investigation certain outstanding factors became evident, viz.:

1. In every case of lungworm infestation, a secondary infection was present.

2. Chronic cases often had few or no lungworms present, the bacterial infection being predominant. The bacterial infection was probably started by the lungworms, but gradually assumed major proportions.

3. Pus and tissue detritus produced by certain organisms were always present with lungworms. A fox free from lungworms usually had a clean trachea.

Ninety-eight per cent of the cultures made from the tracheas of infested foxes

showed two definite types of bacteria always present. The first and less numerous type belonged to the hemolytic group of streptococci. The second type seemed to flourish in predominating numbers in every trachea that had lungworms.

The fact that the two bacteria were always found with every case of lungworms led to the conclusion that the relation is a symbiotic one—that lungworms are closely associated with these organisms and are directly or indirectly dependent on them for food and protection through the by-products and pus they produce.

This interdependence of organisms, of course, is not new. We find it in other diseases, as in amebic dysentery, where a higher complex organism is associated and depends on bacteria for its existence. It is therefore not unreasonable to assume that lungworms are dependent, at least to a certain extent, on one or more associated bacteria. It can also be definitely stated that lungworms usually introduce a certain type of infection, which, in turn, gradually overshadows the lungworms and assumes a major importance, producing chronic infection and death.

Of the two types of bacteria which appear to play this important role with lungworms, one belongs to a widely distributed and well known class, namely, streptococcus. Although streptococci are found in the oral cavities of animals without serious significance, the type found with lungworms is of a distinct hemolytic type, always possessing the same characteristics, the same reactions to the different media and the same pathogenicity.

The characteristics so far determined are as follows:

Streptococcus associated with lungworms: Grows in short chains. Partial hemolysis on blood agar.
Agar colonies, small circular, grayish.
Gelatine not liquefied.
Litmus milk, acid coagulates.
No gas in dextrose agar.
Will make guinea pigs slightly sick. Slightly pathogenic for man.

The pathogenic character was determined by inoculating guinea pigs with a broth culture. A guinea pig becomes sick for two to three days, refusing to eat and remaining in a stupor for that time. It, however, recovers on the third or fourth day.

Its pathogenic character for man was determined accidentally. A month after making the guinea pig test, the writer was washing out the trachea of a fox for a few lungworms. Some of the wash water came in contact with an almost healed cut on his finger. The following evening a slight fever developed with a pronounced rapid pulse of 135, which continued until the following day, when it gradually subsided. The infected finger became swollen and inflamed and remained so for three or four days, and at the end of that time a small amount of pus was discharged. A culture was made from this discharge, and a pure culture of streptococcus was obtained, which upon testing gave exactly the same reactions as that obtained from the fox.

It can be seen that the organism is sufficiently pathogenic to cause inflammation, toxins and by-products in the trachea of a fox, which gradually lowers the vitality of the animal and aids and protects the lungworm. Without this organism the lungworms would have a difficult time in living.

The second organism isolated was more predominant than the streptococcus, and in many cases overshadowed the streptococcus and other organisms entirely. By test on guinea pigs and other animals it was found to be non-pathogenic. However, every indication seemed to point that by its profuse growth in the trachea, as well as on artificial media, it produced an environment suitable for the lungworms. Through lack of media the class to which this organism belongs has not been determined. The following characteristics and reactions have thus far been determined:

Second organism isolated from the trachea of a fox.
Rods: 0.5 by 2 microns, non-motile, gram-negative, occurring singly and in twos.
Growth on agar: Grayish white, entire
Gelatine stab: Not liquefied
Litmus milk: Slightly acid, no coagulation.
Lead acetate not turned brown.
Broth: Turbid.
Gas formed in dextrose.

Staphylococcus albus and *aureus* were frequently isolated along with the above two

organisms, but the indications are that they are accidental and play only a minor part.

Assuming that the two organisms discussed are closely associated with lungworms and that they produce a definite type of infection that is localized, it follows that a resistance and an immunity could be developed against such an infection by a bacterin made from the corresponding organisms. Also assuming that if the existence of the lungworms were dependent on these organisms, then the elimination of these bacteria would eventually starve out the lungworms.

With this proposition in hand the writer set out to test the efficiency of a bacterin made from these combined organisms.

A group of foxes was selected for inoculation that showed definite symptoms of lungworms. The group consisted of two males and six females, all having a bad wheeze and cough. These were the worst cases on the ranch. Inoculations were made in January, the last being made January 30. Before commencing treatment the trachea of each fox was swabbed out with the tracheal swab, and in all cases lungworms were extracted.

Female No. 1. Had bad wheeze and cough all summer and fall, which grew worse. Injected Jan. 5, 8, 12. Examinations: Jan. 30, no perceptible improvement. Feb. 10, appeared improved, not coughing as much. Mated Feb. 13. Feb. 28, very much improved, hardly any cough. March 15, occasional cough, no lungworms on tracheal swabbing. March 30, no coughing. April 6, whelped five healthy pups.

Female No. 2. Had bad wheeze since October. Injected Jan. 5, 8, 12. Examinations: Jan. 30, no perceptible improvement. Mated Feb. 4. Feb. 10, appeared much improved. March 15, no coughing. Whelped March 28 four healthy pups.

Male No. 3. Wheezed since November. Many lungworms extracted with swab. Injected Jan. 5, 8, 12. Examinations: Feb. 10, slight improvement. Feb. 28, no coughing. March 15, no lungworms extracted on swabbing.

Female No. 4. Had wheeze all summer, growing worse with labored breathing. Lungworms extracted with swab. Injected Jan. 14, 19, 23. Examinations: March 15, showing improvement. March 30, apparently well, no lungworm eggs in feces. April 7 whelped three healthy pups.

Female No. 5. Slight rattle and wheeze since November. Injected Jan. 14, 19, 23. Examinations: March 15, improved. March 30, no coughing or wheezing. Has not mated to date.

Male No. 6. Wheeze and rattle since October. Many lungworms extracted with swab. Injected twice only, Jan. 19 and 23. Examinations: March 15, improved. March 30, no coughing or wheezing.

Female No. 7. Bad wheeze since August. Injected Jan. 14, 19 and 23. Examinations: March 30, no coughing or wheeze evident. April 8, whelped six healthy pups.

Female No. 8. Had bad wheeze and rattle since summer, labored breathing. Injected Jan. 19, 23, 30. Examinations: March 15, showing improvement. March 30, no cough or wheeze. April 5, whelped four healthy pups.

Control Foxes

Two males which showed a wheeze and rattle were selected as control animals and were not injected. Although the wheeze and cough did not increase any through the winter and may have slightly subsided on the approach of warmer and wet weather, the wheeze and rattle of both males became more evident and is increasing at this writing. Two other foxes which did not have a wheeze this winter and were not vaccinated began to develop a cough and wheeze about the end of March just when the vaccinated foxes were recovering.

A similar lot of bacterin was sent to a ranch in Ohio for test on ten foxes with symptoms of lungworms. Reports last received indicate that the results of the treatment were highly gratifying.

From the above tests so far conducted, results show that a bacterin made from certain organisms associated with lungworms is highly effective in checking the spread of the secondary infection by building and developing an immunity. This process directly and indirectly affects the lungworms present by eliminating their necessary food and environment.

More extensive experiments with a view to improving the bacterin and methods are now in progress. It is hoped that in the course of a few weeks these experiments will be completed. Without question, if this method of immunization can be utilized, it and the tracheal swab will form the most potent combination known for the control of lungworms so that with proper sanitation and food, loss from lungworms will be a thing of the past in the well-conducted fox ranch.

Important Internal Parasites of Live Stock*

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Introduction

Parasites exact a heavy toll from the live stock industry every year in deaths from the drain of parasitic infestations; in lowered vitality, stunted growth and emaciation of infested live stock; in injury to hides by warbles and other insect parasites which live on or under the skin, and in losses of entire carcasses or parts of carcasses as a result of the invasion of edible parts by parasites, resulting in pathological lesions which warrant condemnation under meat inspection regulations. These losses are ultimately borne by the stockman as added expense in the cost of raising unthrifty stock for the market and in the form of discount made by buyers in fixing the price of stock to compensate for the losses which they expect in meat inspection. This waste and loss can be overcome to a considerable extent by proper attention to curative and control measures designed to reduce losses from parasites.

In the following pages some of the more common internal parasites of domesticated animals are discussed briefly from the viewpoints of symptomatology, life cycles of the infesting organisms, treatment and prophylaxis.

I. PARASITES OF RUMINANTS

With the probable exception of horses, sheep are the most heavily parasitized domesticated animals, both as regards variety of parasites which they harbor and the prodigious number by which they may be invaded, the known damage from parasites being greater in the case of the sheep than in the case of the horse. Wherever any ruminants are kept on more or less permanent pastures the effects of parasitism become evident sooner or later and, in the absence of prompt remedial measures to keep the infestation at a relatively low ebb by means of curative and prophylactic procedures, entire flocks may be wiped out.

Among the more important internal parasites of ruminants, the following deserve special consideration: (a) liver flukes; (b) gastro-intestinal strongyles, of which the stomach worm, *Hemonchus contortus,* and the nodular worms of the genus *Esophagostomum* are the best known, but by no means the only pathogenic species, (c) intestinal tapeworms, and (d) lung worms.

Liver Flukes

The common liver flukes, *Fasciola hepatica,* of cattle, sheep and goats, occurs in the biliary canals and ducts of the liver and may also occur in the lungs and elsewhere as a result of wandering of the young flukes. The life history of these flukes involves snails as intermediate hosts and the species of snail host in the western United States has been recently ascertained to be *Galba bulimoides.* The question of the snail host in Louisiana was recently investigated in the Zoological Division and it was found to be *G. bulimoides techella.* The possibility that other species of snails present in the country may act as intermediate hosts of these parasites has not as yet been excluded.

The eggs produced by the adult flukes are eliminated with the feces and on getting into water or wet places continue their development for a time; a ciliated embryo finally emerging from each visible egg which develops normally. These embryos, after entering a suitable species of snail, undergo pro-

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found morphological changes in the course of which they multiply by means of germ cells, the ultimate larval form being known as a cercaria. A single egg may give rise to 320 cercariae. The cercaria, which is provided with a tail, escapes from the snail, and after swimming around for a time, loses its tail and encysts. The cysts may float on or in the water or may become attached to vegetation or any other convenient object present in the water. When the cysts are swallowed by cattle, sheep, goats or some other suitable definitive host, the larval flukes escape in the digestive tract, and more through the intestinal wall, thus reaching the body cavity where they wander freely over the surface of the viscera. The young flukes finally penetrate the liver capsule and work their way through the hepatic tissue, ultimately reaching the extremities of the biliary canals, where they develop gradually, and invade the bile ducts as they approach maturity.

The losses produced by liver flukes in the United States cannot be accurately estimated at the present time; the estimated losses from the condemnation of cattle livers in abattoirs operating under government supervision, based on data supplied by the Meat Inspection Division of the Bureau of Animal Industry, shows an annual condemnation of livers valued at $200,000. Considering the fact that many fluky cattle are slaughtered in abattoirs not under any sort of inspection or supervision, the annual losses resulting from the condemnation of livers unfit for human consumption on account of the presence of these parasites must be considerably greater than $200,000. Aside from these losses, there still remains to be considered the losses resulting from the lowered vitality of affected animals, loss in condition, and deaths, which must be considerable in view of the known distribution of this parasite and the profound clinical picture which it produces. No data concerning such losses are available at present. However. *Fasciola hepatica* has a fairly wide distribution in this country and is known to be especially prevalent in Washington, Oregon, California and in adjoining states; also in Texas, Arkansas, Louisiana, Alabama, Florida and in other states in the South and Southwest. The total aggregate of damage for which these parasites are responsible in the large areas over which they are distributed must run into several million dollars annually.

The clinical picture of fascioliasis has been studied in sheep, especially by European investigators, and in these animals this parasitic infestation produces profound pathological changes with resultant anemia, edema, and emaciation, the disease terminating fatally in cases of heavy infestation. As a rule no special symptoms are observed in the early stages of infestation, affected sheep usually putting on fat apparently as a result of the initial stimulating effect of the young flukes on the functions of the liver. Gradually clinical symptoms begin to appear, the affected animals becoming dull, and the mucous membranes showing evidence of anemia. The appetite is diminished and rumination becomes irregular. Edematous swellings appear on the pendant portions of the body, such as the region under the jaw, abdomen, breast, etc., and sheep become dropsical. A diarrhea is usually present in the later stages of the disease. If the sheep survive the attacks of the parasites, the latter are eliminated in the course of time, usually in the spring, but sheep which have been heavily infested rarely make a complete recovery, as the damage to the liver leaves that organ impaired.

The symptoms of fascioliasis in cattle are said to be less pronounced than in sheep, these animals being able to withstand the attacks of the flukes and the resultant liver injury far better. However, the bile ducts in cattle undergo extensive and permanent calcification, a condition which never develops, or else is extremely rare, in sheep.

A related species of liver flukes, *Fascioloides magna,* occurs in the liver of cattle and sheep in this country, the parasites being contained in cysts occurring in the hepatic tissue. The cysts contain, in addition to one or more flukes, a dark-colored fluid filled with debris. These worms are, presumably, normal parasites of wild ruminants, which

have become adapted to domesticated ruminants. So far as is known at the present time they are native to this country, there being no records of their occurrence elsewhere except in zoological park or other exported American mammals. The intermediate snail host of this fluke is unknown.

Fascioloides magna is most prevalent near the Gulf of Mexico, especially in Arkansas and Texas, and has been recorded also from the West Coast of the United States and Canada, from several inland points, such as Colorado and Wisconsin, and from the Adirondacks in the East.

This worm is primarily a parasite of cattle, these animals being resistant to the injurious effects of the infestation. Apparently the only injury which *Fascioloides magna* produces in cattle is that associated with the invasion of the liver by the worms. Sheep may be seriously affected by these parasites, the clinical picture in affected animals being similar in many respects to that produced by *Fasciola hepatica.*

Control of Liver Flukes

The control of liver flukes involves treatment of affected animals for the removal of the parasites, the destruction of snails on pastures, and draining, filling or fencing off of wet areas. Carbon tetrachlorid, in doses of 1cc, is an effective treatment for the removal of adult flukes, *F. hepatica,* from sheep. This treatment should be repeated at intervals as long as fluke eggs persist in the feces. For practical purposes, sheep in fluky areas should be treated once a month. Animals which are to be treated with carbon tetrachlorid should be on a high calcium diet for at least a week before treatment. Alfalfa and clover have a high calcium content, and salts containing calcium may be added to the feed. Cattle should be treated with 5cc of carbon tetrachlorid, if there is no calcium deficiency in the blood. Calves tolerate carbon tetrachlorid much better than adult cattle, and milking cows do not tolerate this drug. No treatment has been developed for *F. magna.*

The treatment of pastures with dilute solutions of copper sulphate will destroy snails and thus interrupt the life cycle of the flukes. Pastures may be sprayed with a 0.5% solution of copper sulphate or they may be dusted with powdered copper sulphate mixed with sand in the proportion of 1 part of the former to 4 to 8 parts of the latter. Low and wet pastures are to be avoided so far as possible, and if they are to be used, they should first be properly drained.

II. GASTRO-INTESTINAL STRONGYLES

Domestic ruminants harbor many species of strongyles in the gastro-intestinal tract and suffer severely from this condition in cases of gross infestation, the symptoms being those which are commonly associated with parasitism in general, namely diarrhea or constipation, anemia, edema, emaciation, general debility and cachexia. Fatal results occur in cases of heavy infestation in which anthelmintic medication is not resorted to or in which medication is used too late. On account of the almost continuous reinfestation to which animals on pastures and those in insanitary stables and yards are exposed, treatment for gastro-intestinal parasites of ruminants should be resorted to at regular intervals to keep down the infestation in the affected animals and to cut down the supply of parasite eggs at the source of origin.

Hemonchosis

The stomach worm, *Hemonchus contortus,* occurs in the abomasum of cattle, sheep and goats and produces a severe clinical picture in cases of heavy infestation. The first symptoms are dullness and unthriftiness which may be accompanied by diarrhea; as the infestation progresses affected animals show a general weakness, a capricious appetite, excessive thirst and develop an anemia which is evident from the paleness of the mucous membranes of the mouth and eye and from the edema which often develops under the lower jaw, the last condition being known as "bottle jaw" and "poverty jaw." Sheep may become severely emaciated and succumb to this infestation.

The life cycle of *H. contortus,* which is more or less typical of the life cycles of strongyles generally, is as follows:

Ruminants become infested with *Hemon-*

chus contortus by grazing on infested pastures and in turn contaminate these pastures with their droppings which contain the microscopic eggs of the worms. In warm weather the eggs hatch in a few hours; in cool weather the period of incubation of the eggs is prolonged considerably. If the temperature is below 40 deg. F., the eggs remain dormant; if it is below zero, the eggs are destroyed. Dryness is also fatal to the eggs; moisture, on the other hand, favors their development. The larvae which hatch from the eggs are at first susceptible to freezing and drying; however, after they have undergone two molts and have thus reached the infective stage they become more resistant to these and other environmental influences. In warm weather, the larvae reach the infective stage in 2 or 3 days; at temperatures below 70 deg. F., this period is considerably prolonged, and may take several weeks at temperatures which are sufficiently low to retard development but not low enough to inhibit it entirely. The infectious larvae migrate up grass stalks or other objects where sufficient moisture is present to permit such migration. When the air becomes dry and the moisture evaporates, the larvae become inactive, resuming their activities, however, when moisture is present again, as during rains, fogs and dews. After being swallowed the larvae reach the fourth stomach where they settle down and develop to fertile maturity in from about two to four weeks.

In a general way the life history of other species of strongyles occurring in the gastro-intestinal tract of ruminants is similar to that of *Hemonchus contortus* so far as these life histories have been ascertained. There are numerous gaps in our knowledge of the life histories of many species which are known to be pathogenic; in fact our knowledge of the life cycles of most species of strongyles which occur in ruminants is extremely sketchy and is based to some extent on assumptions and inferences. However, the essential facts on the life history of *Hemonchus contortus* as outlined in the foregoing are very similar to those observed in related strongyles which have been studied, and it is fairly safe to assume that this mode of development is typical for strongyles generally.

Worms related to *Hemonchus contortus* which deserve special consideration in connection with parasites of ruminants are: Ostertagia, Cooperia, Bunostomum,Trichostrongylus and Esophagostomum.

Ostertagia

Ostertagia ostertagi occurs in nodules in the wall of the fourth stomach and free in the lumen of that organ in cattle. This species has also been recorded as occurring in nodules in the fourth stomach of sheep in this country by the writer and similar records are available from South Africa and Europe. The nodules are grayish in color and may be surrounded by a yellowish brown area. The worms penetrate the glands and crypts of the stomach and injure the epithelial lining as a result of pressure atrophy and in other ways. They produce anemia, and the presence of numerous nodules gives rise to a catarrhal inflammation of the mucosa.

A related species, *O. circumsincta,* occurs in sheep in this country usually in association with *H. contortus;* this species is the "stomach worm" of sheep on the Pacific Coast where *H. contortus* is absent or rare. As far as can be judged from reports from Europe, this worm causes heavy losses among lambs.

Cooperia

Cooperia punctata occurs in the intestine and fourth stomach of cattle and sheep. These worms occur in the lumen and have been found in the intestinal mucosa of calves where they produce caseous nodules. This parasite sometimes occurs in large numbers in the intestines of cattle and is apparently very injurious to them, causing the deaths of calves in some cases.

Bunostomum

Bunostomum phlebotomum is the cattle hookworm which occurs in the small intestine and occasionally in the stomach. These parasites are evidently pathogenic when present in large numbers and produce a condition characterized by a low fever,

diarrhea, loss of appetite, constipation, progressive emaciation and pronounced anemia which may lead to a fatal termination. The lesions produced by the parasites on the intestinal mucosa are similar to those produced by other species of hookworms. The injuries produced by the attachment of the worms to the mucosa may cause severe inflammation and afford an avenue for the entrance of pathogenic bacteria.

A related species of hookworm, *Bunostomum trigonocephalum,* occurs in the small intestine of sheep and goats and apparently produces symptoms similar to those produced by cattle hookworms and other species of hookworms. This species has a buccal armature capable of lacerating the intestinal mucosa and the worm is evidently a blood sucker.

Trichostrongylus

Several species of very small slender roundworms belonging to the genus *Trichostrongylus* are by no means uncommon in the intestine and fourth stomach of domestic ruminants, and are capable of producing a severe gastroenteritis.

Esophagostomum

Nodular worms occurring in ruminants belong to the genus *Esophagostomum,* the common nodular worm of sheep and goats being *E. columbianum.* The adults of this species occur in the lumen of the large intestine while the larval worms occur in nodules in the wall of the small and large intestines, the mesenteric lymph glands, the omentum, the liver, the diaphragm and the parietal pleura.

The symptoms associated with these worms resemble those produced by other pathogenic strongyles and range from such symptom complex as general debility, moderate anemia, and emaciation, to an aggravated picture of severe emaciation and a marked diarrhea. In severe cases these worms may cause death. The parasites interfere with normal growth and development, affect the meat and the wool, and lower the condition of the affected animals. Intestines harboring these nodules, so called "knotty guts," are unfit for sausage casings.

Nodular worms in cattle, *E. radiatum,* produce smaller nodules on intestinal mucosa than those produced by *E. columbianum* in sheep. The cattle nodular worms produce a chronic enteritis, a progressive emaciation, anemia and cachexia in gross infestations. In mild infestations no symptoms are noted. The symptoms are as a rule milder than those observed in nodular-worm disease in sheep.

Treatment for Gastro-Intestinal Worms

Following are the standard treatments for stomach-worm infestation in cattle and sheep: One per cent solution of copper sulphate, the dose being 1 liter for a full-grown bovine, and 100cc for a full-grown sheep. Lambs should be given 50cc of this solution. The addition of 1% powdered tobacco or snuff to the 1% solution of copper sulphate, or the addition of one ounce of a 40% solution of nicotin sulphate to each gallon of the 1% solution of copper sulphate is indicated when affected animals also harbor tapeworms and hookworms, since copper sulphate alone does not remove these parasites. Tetrachlorethylene in capsules is approximately 100% effective against stomach worms in sheep, the dose being 5cc for an adult animal. This should be preceded by a fasting period of 12 hours. This treatment is also more or less effective against other species of strongyles present in the gastro-intestinal tract. Dr. M. C. Hall makes the following recommendations with reference to the treatment of sheep for gastro-intestinal parasites:

> In flocks in which stomach worms are the principal cause of trouble, and in which tapeworms are also present, the copper-sulphate solution may be used as a routine treatment, with the copper-sulphate-and-nicotin-sulphate or copper-sulphate-and-tobacco solutions substituted for it three or four times a year. If hookworms and other roundworms, other than the common stomach worms, are present and tapeworms are believed to be present, the sheep may be given tetrachlorethylene as a routine treatment and the copper-sulphate and nicotine-sulphate or copper-sulphate and tobacco solutions substituted for it three or four times a year.

Tapeworm Infestation

Tapeworms occurring in the intestine of cattle, sheep and goats belong to the genus Moniezia. Sheep also harbor the fringed tapeworm, *Thysanosoma actinioides,* which

usually occurs in locations other than the intestine, namely the gall ducts, gall bladder, biliary canals of the liver and ducts of the pancreas. Adult cattle do not appear to suffer from tapeworm infestation, whereas calves may be severely affected and show scouring and emaciation. Sheep are similarly affected by intestinal tapeworms and as a result show a poorer resistance to adverse conditions, such as bad weather and poor food, and succumb more readily than sheep free from tapeworms. The fringed tapeworm obstructs the bile ducts and pancreatic ducts and interferes with the functions of the liver and pancreas. It also causes loss in flesh and wool and renders these animals unthrifty.

The life history of tapeworms of sheep and cattle has not been ascertained.

III. LUNG-WORMS

Lung-worms of cattle, *Dictyocaulus viviparus,* are especially injurious to calves, and produce a bronchitis characterized by a rather destructive spasmodic cough, which is especially troublesome at night. In severe cases the animals have a rapid respiration and show evidence of suffocation which may terminate fatally. Other symptoms characteristic of parasitism generally may be present in lung-worm disease of calves. A related species of lung-worm, *Dictyocaulus filaria,* occurs in sheep and goats, the symptoms being very similar to those produced by the cattle lung-worm. Another related species of lung-worm, *Synthetocaulus rufescens,* also occurs in sheep and goats and produces a pneumonia. The eggs and larvae of this parasite may be aggregated in pneumonic patches of the lung which take on the appearance of nodules or tumors."

Medicinal treatments for lung-worm disease are not satisfactory. Nursing treatment is safe and satisfactory for tiding infested animals over the critical stages of the disease.

Prophylactic Measures

Prophylactic measures, with reference to gastro-intestinal parasites of ruminants and also lung-worms, involve among others the following procedures. Pastures should not be overstocked; burning over the pastures will destroy most of the young worms on the grass and on the ground, and under certain conditions this procedure may be indicated; pasture rotation, as often as available pastures permit, is highly desirable. Water should be supplied from wells, springs or flowing streams, preferably in troughs raised

Next to Horses Sheep Are the Most Heavily Parasitized Domesticated Animals

above the ground. Low and wet pastures should not be used, or should be properly drained. Affected animals should be isolated and given special care. Stables and sheds should be kept in sanitary condition. Young animals should be given special care, as they are more susceptible to parasites and suffer more from the effects of parasitism than older animals.

IV. PARASITES OF HORSES

Horses are probably the most heavily parasitized of domesticated animals. Over one hundred species of worm parasites have been reported from horses; many of these are so closely related as regards form, location in the body, habit and presumably life history, that for practical purposes they may be commonly lumped together as cylicostomes, under which name several genera are included. Bots, stomach worms, ascarids, the large strongyles generally known as "red worms" and "blood worms," cylicostomes, pinworms, and filarids are the most common of the internal parasites of horses.

Bots

Three species of bots occur in American horses, as follows: *Gastrophilus intestinalis,* the common botfly, is widely distributed in all parts of the United States; *Gastrophilus nasalis,* the throat botfly or chin fly, also has a wide distribution and is especially common in the Rocky Mountain States; *G. haemorrhoidalis,* the nose fly, is largely confined at present to the North Central and certain of the Rocky Mountain States, but it is apparently spreading to adjoining regions. It has not yet been ascertained how the maggots of these flies get into the stomach; it is known, however, that having gotten into the stomach, they remain in this location for eight months to a year or longer, and pass out of the body at the end of their period of parasitic life. They pupate on or in the ground and the adult flies which emerge start the cycle of development once more by depositing the eggs on and gluing them to the hair of horses.

Bots bear spines on a large portion of the body surface and they have rather formidable mouth hooks by which they attach themselves to the mucous lining of the stomach, the attachment of many bots causing a considerable degree of irritation, and producing zones of inflammation in the parasitized areas.

While the use of various mechanical devices to protect horses from the attacks of the adult flies and their eggs, the application of various solutions to the skin to destroy the eggs and the application of fly repellents, and other preventive measures may do some good, the medicinal treatment of horses for the removal of bots is the most effective known weapon for combating these parasites. Carbon bisulphid, in doses of six fluid drams (25 cc.) for a horse weighing 1,000 pounds, is approximately 100% effective against bots. Food should be withheld for 24 to 36 hours before treatment and food and water should be withheld for about three hours following treatment. The best time to treat is in the late fall, a month or so after the adult fly has disappeared.

Stomach Worms

Four species of stomach worms occur in horses. One species, *Trichostrongylus axei,* has a direct life cycle, whereas the other three species, which belong to the genus Habronema, have more complicated life histories, which involve flies as intermediate hosts. It should be noted that one species, *Habronema megastoma,* produces tumors in the stomach which may attain the size of a hen's egg and that *T. axei* produces umbilicated adenoma-like growths on the gastric mucosa.

There are no standard treatments for horse stomach worms; however, the drugs used for the removal of other horse parasites may also remove some of the stomach worms.

Intestinal Worms

The large intestinal roundworms of horses, *Ascaris equorum,* are common parasites and are especially injurious to foals. These worms may occlude the lumen of the intestine, perforate the intestinal wall, produce a severe gastro-enteritis as a result of continuous irritation, and injure their hosts in other ways. In addition to deleterious action of the worms in the intestine, it is also important to consider the injuries produced

by the migrating young larvae in the course of their passage through the liver and lungs. Pulmonary disturbances, elevation in temperature, and coughing have been noted in experimental ascariasis in horses.

Treatment of horses for the removal of ascarids consists in the administration of carbon bisulphid as already noted in connection with treatment for bots. The efficacy of this drug on *A. equorum* is approximately 100%. Carbon tetrachlorid in doses of 6 to 12 fluid drams for adult horses is less effective in removing this parasite.

Prophylactic measures against these worms involve sanitary procedures similar to those used in connection with the prevention of roundworm infestation in swine.

Of the species of strongyles which are parasitic in the large intestine of horses, the three species of Strongylus and *Triodontophorus tenuicollis* deserve special consideration. The latter has a buccal armature provided with blade-like teeth and is known to produce severe ulcerations of the mucosa of the colon. The three species of Strongylus are blood suckers and are firmly attached to the mucosa. They produce anemia as a result of the direct abstraction of blood and injure the intestinal epethelium at the points of contact with the mucosa, thus affording an avenue for the entrance of pathogenic bacteria. One species, *Strongylus vulgaris,* is of special importance in that the immature forms of this species occur in aneurisms of the anterior mesenteric artery. Portions of the clot which occurs in the aneurism may become dislodged and may obstruct an artery supplying blood to a part of the intestine, and cause colic, or may lodge in an artery of the hind leg and cause intermittent lameness.

The large strongyles and the numerous species of cylicostomes in horses produce a clinical picture characteristic of gross infestation with parasites, common symptoms being weakness, anemia, emaciation, a rough coat, sunken eyes, poor appetite and digestive disturbances of various sorts.

So far as they have been ascertained the life cycles of horse strongyles are similar in a general way to those of related species occurring in ruminants; however, extensive migrations of the larval forms are known to occur in several equine species, resulting in an invasion of many organs and tissues by agamic worms.

Treatment for the removal of strongyles consists in the administration of carbon tetrachlorid, as already noted in connection with treatment for ascarids, or oil of chenopodium, after a 36-hour fasting period, in doses of 4 to 5 fluid drams (16 to 20cc) for an adult horse, immediately preceded or followed by a quart of raw linseed oil or an aloes ball.

Pinworms, *Oxyuris equi,* produce an anal pruritis and cause horses to rub the tail and buttocks against any convenient object, and this may result in considerable excoriation of the perineal region. Oil of chenopodium, as recommended for the removal of strongyles, is also effective against these parasites.

Filarids

Two species of filarids occurring in horses deserve mention in connection with a brief discussion on horse parasites. They are as follows: *Oncocerca cervicalis,* which occurs in the ligamentum nuchae and which is considered by some parasitologists to be the primary etiological agent of fistulous withers by causing a localized lowered resistance to bacteria. These worms show a disposition to form fibrous tumors. *Setaria equina* is a long, slender worm which usually occurs in the abdominal cavity and sometimes under the peritoneum and has also been reported from other locations. The larval forms of this species occasionally occur in the eyes of horses, this condition being rare in this country but apparently common in India. According to some parasitologists most of these eye-worms have proved to be the cattle filarid, *F. labiato-papillosa,* when carefully examined. The pathogenicity of the adult worms has not been ascertained.

Advantages of Treatment

There is considerable evidence to prove that parasites interfere with the working efficiency of horses and keep down their weight. Wright treated 2,000 horses for the removal of parasites and the report on 400 treated horses shows that the working effi-

ciency of these animals was increased by 50%. Morris reports that mules which he treated for worms twice a year were remarkably free from colic, and gained weight while hard at work. A report from England states that, after being treated for the removal of parasites, the horses which were involved made an average gain of about 38 pounds. Work carried on by the Zoological Division in cooperation with a horse breeder in the control of parasites has shown highly gratifying results. The Army Veterinary Corps also reports good results from the treatment of colts for worms.

V. PARASITES OF SWINE

Among the internal parasites which occur in domestic swine in the United States the following are the most important from the viewpoint of veterinary medicine: Stomach worms, ascarids, thorny-headed worms, nodular worms, whipworms, lungworms and kidney worms.

Stomach Worms

The worms occurring in the stomach of swine are briefly noted as follows: *Hyostrongylus rubidus,* the red stomach worm of swine, is a strongyle and has a direct life history, infestation resulting from the ingestion of infective larvae. These parasites are often found in association with a pathological condition of the gastric mucosa characterized by a hemorrhagic appearance and catarrhal exudate. While some workers regard these alterations in the stomach wall as a direct consequence of the injury produced by the worms, others have regarded them as due to a secondary bacterial invasion, the injuries produced by the worms paving the way for the entrance of pathogenic bacteria. *Arduenna strongylina* and *Physocephalus sexalatus,* the other two species of swine stomach worms, produce pathological changes in the gastric mucosa, characterized by the formation of a thick pseudo-membrane which is firmly adherent to the pyloric portion of the stomach. Some investigators have regarded the pseudomembrane as possibly due to bacteria which invade the mucosa previously injured by the worms.

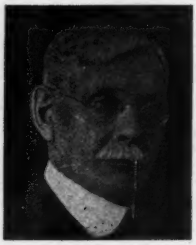
The life histories of the latter species of worms are complex, involving beetles as intermediate hosts, swine becoming parasitized as a result of swallowing the infested secondary hosts.

There is no standard treatment for the removal of swine stomach worms. Chenopodium in doses similar to those recommended later for ascarids and tetrachlorethylene are worthy of trial in connection with treatment for the removal of these parasites.

Ascarids

The swine ascarid, *Ascaris suum,* is one of the most injurious parasites with which the hog raiser has to contend. Investigations carried on in the Bureau of Animal Industry and by agricultural experiment stations have shown that when swine are raised under conditions which are designed to prevent infestation with these roundworms, uniform litters, practically without runts, are produced and that the pigs are ready for market several weeks earlier than those raised under ordinary conditions. The experiments on swine sanitation carried out in McLean County, Illinois, for a period of six years, have shown moreover that swine sanitation

J. R. Mohler, 1913



V. A. Moore, 1919

A. T. Kinsley, 1922

C. A. Cary, 1920

Former Presidents of the American Veterinary Medical Association

increases the number of pigs per litter marketed by 50%.

As is well known, the life history of this parasite involves extensive migrations of the newly hatched larvae, which leave the intestine and are carried by the circulation to the liver, and from the liver to the lungs and thence by way of the trachea back to the stomach and so to the intestine where they attain fertile maturity. The passage of the larvae through the lungs produces a localized or a generalized pneumonia. In young pigs the condition known as "thumps" is commonly due to larval ascarids. The symptoms associated with the adult worms in the intestine are a more or less marked enteritis and poor condition, accompanied by digestive disturbances. The worms also retard growth and reduce the vitality of their hosts in many other ways. Ascarids are also capable of producing serious consequences as a result of mechanical obstruction of the lumen of the intestine and a result of their wandering habits. These parasites elaborate toxic substances and there is a possibility that the symptom complex of ascariasis may be due, in part, to the absorption by the host of toxic substances secreted by these worms.

The most effective treatment for the removal of ascarids from swine consists in the administration of oil of chenopodium at a dose rate of one fluid dram to a 100-pound animal immediately preceded or followed by two ounces of castor oil, or the drug may be given in the oil. For hogs weighing over 200 pounds, two fluid drams of chenopodium are probably adequate. The animals should be fasted for 18 to 24 hours before treatment and food and water should be withheld for 3 hours after treatment. For little pigs plenty of castor oil should be used and the dose of chenopodium should be reduced.

Preventive measures are largely matters of sanitation, as determined by the extensive investigations carried out by the Bureau of Animal Industry in McLean County, Illinois. The essential steps in swine sanitation are as follows: Where permanent farrowing houses are used they should be thoroughly cleaned and scrubbed with hot water and lye. Before farrowing the sow should be washed, especially around the udders, with warm water and soap and placed in the clean farrowing pen. Within two weeks after farrowing the sow and pigs should be hauled to a clean pasture previously sown to a suitable forage crop. The pigs should remain on clean pasture and away from older hogs other than their mothers until they are at least four months old, at which age they will have developed the hardiness to withstand to a great extent the attacks of parasites and will also have acquired sufficient resistance to their deleterious effects. When the permanent farrowing houses are not used, as in the case of fall farrowing in the North and generally throughout the year in the South, washing the sows may be omitted in cases in which they have been on pasture and are not encrusted with mud. The pigs may remain on the clean farrowing pasture or may be moved to another clean pasture and kept under sanitary conditions and away from older hogs as already outlined.

Thorny-Headed Worms

Thorny-headed worms of swine, *Macranthorhynchus hirudinaceus,* occur in the small intestine, especially in the duodenum, the head of the worm being deeply embedded in the wall of the gut. This attachment sets up an inflammatory condition and occasionally the worms may even perforate the intestine and produce peritonitis.

There is no standard remedy for the removal of these parasites, although a number of treatments have been recommended from time to time, largely on the basis of worms passed, without the critical evidence of the number of worms which the drug in question failed to remove. Inasmuch as the life history of these parasites involves May beetle larvae as intermediate hosts, measures for the destruction of the grubs, which serve as the intermediate hosts of these parasites, are valuable procedures in connection with the control of thorny-headed worms.

Nodular Worms

Two species of nodular worms have been reported from domestic swine, one species,

Esophagostomum dentatum, having a world-wide distribution while a related species, *E. longicaudum,* appears to have a more limited distribution, there being but very few published records of its occurrence. Nodular worms of swine have a direct life cycle, infestation resulting from the ingestion of infective larvae. The young larvae occur in connective tissue cysts in the wall of the large intestine where they produce small nodules. Presumably the presence of these worms in the intestine produces some deleteriolus effects on the host, but this subject requires further investigation; the published data concerning the pathogenicity of these worms are inadequate to warrant any definite conclusion.

Whipworms

Whipworms, *Trichuris suis,* are common parasites of swine, located in the cecum, the anterior end of the worms being firmly attached to the mucosa. In light and moderate infestations no symptoms are noted, in heavy infestations weakness, emaciation, and localized injuries at the points of attachment of the worms have been recorded.

The life history of these parasites is presumably direct, infection resulting from the ingestion of ripe embryonated eggs.

Treatment for the removal of these worms has not been established by critical experiments.

Lung Worms

Lung worms in domestic swine represent three species and two closely related genera as follows: *Metastrongylus elongatus* is the most common lung worms of swine in this country; *Choerostrongylus brevivaginatus* is next in the order of frequency of occurrence, and *M. salmi* is comparatively rare in the United States. Lung worms are located in the bronchi and bronchioles, and produce a verminous bronchitis characterized by a cough, and in heavy infestations the worms cause pneumonia. Small nodules, resembling tubercles, occur in lungs harboring these parasites. In a general way the symptoms and lesions of lung-worm infestations in swine are similar to lung-worm disease in cattle.

The best and safest treatment for lung-worm disease is good nursing, good food and safe drinking water. Infested animals should be isolated to keep the disease from spreading. Inasmuch as the life history of swine lung worms has not yet been ascertained, rational prophylactic measures cannot be recommended. Sanitary measures and cleanliness in general will do much to reduce lung-worm infestation.

Kidney Worms

Kidney worms, *Stephanurus dentatus,* are especially prevalent in the South where they constitute an actual and potential menace to the swine industry. The losses from kidney worms include condemnation of affected livers and other edible portions which are invaded by the parasites. In one packing house in Georgia the annual losses as determined by Nighbert and Connelly amount to $80,000 from condemnation under meat-inspection procedure. This represents but a part of the actual losses, due to kidney worms, as it leaves out of consideration entirely stunted growth and death among pigs for which these parasites have been shown to be responsible in the course of investigations carried out by the writer in collaboration with Dr. E. W. Price.

Kidney worms invade the liver, the lungs, the pancreas and other internal organs and tissues, the mature worms occurring in tumors in the perirenal fat. In heavy infestations the entire kidney region is involved with pronounced tumor formation. In view of the abscesses for which this worm is responsible there is a great liklihood of the absorption by the host of toxic substances in addition to the mechanical injuries produced by these parasites.

Owing to their location, kidney worms are beyond the reach of anthelmintics, so far as is known at present. Prevention of kidney-worm infestation is largely a matter of sanitation. This phase of the problem is still in the experimental stage; its solution is of great practical importance to the southern swine grower and the Bureau of Animal Industry is conducting experimental work in the South with a view to solving this important problem.

Colorado Poisonous Plants

By L. H. PAMMEL, Ames, Iowa

L. W. DURRELL and Geo. H. Glover are the authors of a twenty-eight page well arranged bulletin on Poisonous Plants of Colorado. The information about the toxic properties, symptoms and distribution of plants is very concise.

Six plants which are injurious in a mechanical way are described. Of these the most important is the needle grass. Of the poisonous plants the following are some of the plants described: Monkshood, arrow grass, loco, lupine, purple larkspur, sneezeweed, sorghum, cowbane or water hemlock, white hellebore, whorled milkweed, woody aster, ergot; and of the occasionally poisonous, some eighteen more of these: snow on the mountain, rattlebox, choke cherry, sorrel, Indian hemp, cow herb or cockle. There are of course many others. I recall seeing much of the poison hemlock, *Conium maculatum,* of Europe near Golden, Colorado, and no doubt has spread rapidly since I first saw it there some 15 years ago. The name poison hemlock is used for the cowbane. This name should be applied only to the European *Conium maculatum.* The following very interesting statement is made concerning range management:

"Overgrazing is either a direct or contributing cause of stock poisoning. This is the natural consequence of the eating off of the more palatable plants. Poisonous plants in general are not palatable and are eaten only under stress of necessity. Under conditions of over-grazing, the grasses and other more tasteful plants are cropped to destruction, especially where too early use is made of the range, and the poisonous plants, where present, over-run the range. Animals run on such over-grazed areas, especially in dry seasons, find little to feed on but poisonous species of plants.

"The relation between the scarcity of food and losses from eating poisonous plants cannot be too forcibly emphasized. A number of plants ordinarily not considered poisonous, such as the fetid marigold, *Dysodia papposa,* and broom weed, *Gutterizia sarothrae,* under these conditions may cause injury.

"Larkspur and Milkweed poisoning is most likely to occur either during seasons of drought and short feed or on over-grazed areas. In either case the poisonous plants are the most conspicuous and attract the animal. Under similar conditions water hemlock roots are pulled up and eaten when ordinarily with plenty of forage they would not be touched."

The range should be avoided when poisonous plants occur. The authors have well said:

"Some plants are more poisonous at certain times and under certain conditions than at others and care in the use of range at these times may avoid injury. Thus, common death camas is a spring plant which dries up after blossoming and disappears. Most cases of sheep poisoning from death camas occur in May and June when the plants grow in advance of the grasses and are eaten to exclusion of other plants.

"The seeds of the lupines are especially poisonous and greatest harm comes from these plants late in summer when pods are full of seed. The seeds mature late in summer and most cases of lupine poisoning occur at that time. Lupine-infested areas should then be avoided. As the seeds frequently fail to mature in dry seasons there is in such years less chance for damage.

"The low larkspurs are spring plants and in lower elevations disappear by July. If cattle are kept from ranges covered with them until July, there is little danger of loss. The tall larkspurs blossom later and do not die till frost. After blossoming, however, they have lost much of their poisonous property. In general, the Colorado ranges are safe from larkspur poisoning by the middle of July. Larkspurs are also most poisonous when the leaves are wet from dew, rain or snow."

Poultry Practice and the Veterinarian

By W. B. CHAPMAN, Powersville, Missouri

POULTRY practice is one phase of veterinary work that is neglected by a great many veterinarians and completely ignored by a few. This is not as it should be, for when we consider the enormous amount of money invested in the poultry industry of this country and the many diseases and fatalities peculiar to fowls, many of which can be prevented by proper management and treatment, it seems but justice that the poultry industry should have the benefit of the veterinarian's knowledge in helping curtail these avoidable losses. It is the duty therefore, of every practicing veterinarian to become thoroughly acquainted with the many ills affecting poultry and to lend his scientific aid in the way of advising the poultry raiser in management and care of the flocks as well as to prescribe the necessary remedies when indicated.

This branch of practice, besides being a remunerative one, affords a good medium for ethical advertising. The average farm flock represents an investment of from $100.00 to $500.00 and by educating the poultry raiser to the fact that management, care, feeding and therapeutics judicially applied play an important part in the profits on his investment, he does not hesitate to employ veterinary services. As a rule, the general farm flock is the property of the housewife and when "Dr. Brown" treats her chickens, she usually loses no opportunity of informing her neighbors of the fact. An indirect form of advertising is derived from this medium of publicity.

The nostrum industry has, in the past and is at present, reaping a rich harvest off the poultry raiser. Their methods are usually unscrupulous in persuading the poultryman to purchase their wares. These practices contest the field with the practicing veterinarian and only by his superior knowledge of disease and an opportunity to see and to diagnose each separate ailment is he able to compete with this nuisance. However, few poultrymen hesitate to consult and follow the veterinarian's advice in the matter of therapeutics, providing the latter proves his ability in handling poultry diseases.

The indifferent veterinarian cannot expect the poultry raiser to implore his aid in helping solve his poultry problems. The indifferent attitude must be exchanged for one expressing real interest in poultry practice.

Poultry practice is a comparatively new field for the veterinarian and the public must be informed of the fact that veterinarians are capable of coping with poultry disorders before they will become accustomed to employing this type of service. This is another reason why every veterinarian should assume it as his duty to qualify himself in poultry practice.

A very good method of informing clients that the veterinarian is equipped and ready to diagnose and treat poultry diseases is by means of pamphlets made out to that effect and mailed with statements, or separately. Some offer free diagnosis and laboratory service where birds are brought to the office. In the writer's opinion, this is no serious violation of ethics and is attended with very good results in educating the poultry raiser to rely more upon the veterinarian for advice.

This article is not intended to advance any particular or new method of poultry therapeutics, but rather the aim of the writer is to call the attention of all veterinarians to the importance of the poultry industry, and to stress the fact that a poultry practice, judicially handled, is the means of materially increasing one's income and at the same time of rendering a real service to a deserving industry.

Uniformity in practice is a boost for the veterinary profession in general, but when one member of a profession claims

knowledge on a certain subject to which another member of the same profession pleads ignorance or indifference, it does not look well to the laity. It is the duty of the veterinary profession to lend every assistance possible to the poultry industry in handling poultry diseases by research and otherwise. We as members of that profession should convey to the poultry raiser the information made available through scientific sources and consider poultry diseases just as important as any other in the realm of veterinary practice.

Veterinary colleges are instituting stronger and more thorough courses on poultry practice in their curricula and consequently present-day veterinary graduates are leaving school better equipped to handle poultry disorders than were their predecessors. By attending short courses and veterinary association meetings, both of which are devoting a good share of their programs and clinics to poultry practice, and by earnest observation and study of the splendid material made available by current veterinary literature, any veterinarian can make himself thoroughly acquainted with the latest methods used in poultry practice. Therefore, it is imperative that every veterinarian work harmoniously with the veterinary profession in helping solve the many problems incidental to poultry practice. By so doing, he will secure the confidence of the poultryman and at the same time broaden his service to humanity.

THIS IS THE LIFE

"Where's the veterinary in this here burg?" inquired the farmer who has just recently moved into the community.

"Ain't none," answered the druggist. "Yuh see, Doc Killam quit last year and is runnin' a service station down there on the corner. If yuh got any troubles yuh might see him, although he won't go out now fer nobody."

So the newcomer rushed down to see "Doc." He met the affable ex-practitioner, and began:

"Yuh see, Doc, I got a cow what ain't cleaned, an' I wisht you'd come out."

"Nope," decidedly answered the ex-placenta remover. "I'm outta practice for good, and that don't mean maybe."

"Ain't there enough work?" queried the newcomer.

"They was," bitterly answered the ex-graduate, "but there isn't now. Let me tell you, partner, what happened.

"I usta test all the cows supplying milk for the town. The federal men now do it free of charge. They got three or four workin' now out with the county agent. Usta have a little cholera vaccinatin', but th' county agent learned the farmers how to do it, sold 'em syringes, supplies 'em serum and virus at cost, so that's shot. There are three medicine wagons working out of this town, supplying barb-wire liniments, colic dopes, and all kind of powders. Only time the vet is called now is when they think the animal is going to bleed to death."

"Shippin' out stock has to be inspected, don't it?" inquired the newcomer.

"Only the local practitioner don't do that any more. A state man from the capital comes and does it at so much per day and expenses. They have two or three state guys doing nothing but this. As a tax payer, I help pay their salaries, so they can come in and do part of my work at less than I can do it. If there is any contagious disease around, they also come and do all the work, get big write-ups in the local weekly, and pass me up entirely."

"But there must be some dairy work, isn't there?"

"Only once in a while. You see we have a couple local boys who took a short course up at the university. The professors there taught them how to do everything without the aid of a veterinarian. These babies help out their neighbors, too. They treat milk fevers, bloats, garget, calving troubles, and even abortion.

"The Only Time I Was Ever Called Was When They Thought the Patient Was Going to Die"

"But what happens when cholera breaks out?"

"Oh, the county agent wires the federal inspector in charge of hog work, and he sends a government man, who makes an examination, quarantines 'em, and he turns it over to the state guys. The local veterinarian is completely ignored."

"Isn't there any calves to vaccinate against blackleg?"

"Nope; the college extension department veterinarian held meetings all around here and taught the farmers how to do that themselves."

"But, good heavens, man, how do the live stock owners get along for the ordinary accidents, colics, and so on?"

"The only time I was ever called was when they thought the patient was going to die. I fool 'em now; I let 'em die without me acting as pall-bearer."

"Kinda tough pickings, wasn't it?"

"Yep; for a man who spent four years in a state university and then found out the government, state, county and college officials all working against him in a nice, easy, diplomatic way, was a surprise to him. Tractors and trucks and the live stock owners themselves do not do the harm that salaried veterinarians within our own ranks do. There are a few places yet where a man can get by if he has a big territory, but they are getting scarcer every year. After I got started in this business, and put my instruments away in a big box and locked it up and threw away the key, occasionally a call would come in, just like yours. I turned 'em all down. I'm through. If this service station ever goes flooey, I may grab off a salaried job myself, and look wise and go around over the country telling the boob vets who are still in practice how much I love 'em."

"Lots of guys makin' money in the dog game, ain't there?"

"There has been, but the way these Humane Hospital free clinics is going in, wait about several years and hear the small animal practitioner holler. Free ambulances; free service; free booklets; free everything! That's what the city guy will have to buck. Maybe I am pessimistic, but I am not imitating the ostrich."

"Well, what am I goin' to do about that cow?" anxiously inquired the newcomer.

The ex-graduate grinned. "Tell you what I'd do. Get th' county agent to do it for you. He don't like to leave his desk very long, or take off his gloves, or get away from the newspaper reporter very far, but just tell him he's got to help you out. Goodbye; there comes a customer for free air, free water for his battery, and he wants his radiator filled, also. Fare-thee-well."

Bill Bilious.

Swine Diseases*

By H. R. SCHWARZE, East St. Louis, Illinois

In reviewing the history of swine diseases, it is interesting to note that very little attention was given this phase of veterinary practice in this country, prior to the time that Dorsett, Niles and McBride of the United States Department of Agriculture demonstrated that hog cholera is caused by a filtrable virus. Following this discovery, the same investigators developed an anti-serum which has been used ever since with gratifying results in preventing this disease.

The research work that was done prior to the discovery that disease is due to a filtrable virus apparently was discredited by the virus discovery. In some ways this had an unfortunate effect. It seemed to convey the impression, and was accepted by many, that hog cholera is the only contagious disease of swine of any consequence, and that it need not be feared since an anti-serum was now available to immunize herds against this malady. This belief has caused no end of trouble and grief in which the serum producers, practicing veterinarians and the swine owners have shared equally.

It may be said that the filtrable virus discovery and the introduction of anti-hog cholera serum has been the chief factor in stimulating the study of swine diseases. This may be accounted for by the fact that hogs vaccinated with serum and virus often develop disease which invariably was diagnosed as hog cholera due either to a non-virulent virus or an impotent serum or both.

The personnel in the majority of laboratories producing anti-hog cholera serum and virus, were conscientious and turned out a product, as near to the standard as it possibly could be made. The veterinarian in the field administered the product according to directions and the owner of the herd in most instances co-operated in the after care and sanitation of the herd; still trouble came and not infrequently.

Reviewing the general results obtained from vaccinating swine with serum and virus, it suggested itself that there must be some other reason than impotent serum and non-virulent virus for the so-called breaks, or that perhaps swine were subject to other infectious diseases in which the symptoms and lesions were confusing. The many problems that presented themselves apparently in connection with hog vaccination stimulated the desire to study swine diseases.

During the beginning of the swine vaccinating period, many bulletins were published by serum producers, state and federal regulatory departments and state agricultural colleges. A sad thing about these publications was that they were practically all more or less copies of descriptive literature on hog cholera as found in text-books that were published before the virus discovery. The clinical symptoms and pathological lesions described as being those of hog cholera were misleading because of the lack of a thorough knowledge of swine diseases. The symptoms described were body in-coordination, dry cough, sniffling, conjunctivitis, discoloration of the skin, inappetence, drooping of the tail and constipation, or at times a fetid diarrhea, etc. The lesions generally described were petechia and ecchymosis of the kidney, bladder, lung, skin, etc. Sometimes a gastritis and enteritis. The button ulcer in the cecum and around the illeo-cecal valve was considered an important diagnostic lesion in hog cholera. During the amateur period of hog vaccination, papers and discussions on swine disease always occupied a large portion of the program at veterinary and live stock sanitary meetings In fact, there was far more interest taken in the swine program than in any other subject.

It was indeed interesting at that time to observe the difference of opinion by representative men of the veterinary profession.

*Read at the thirty-eighth annual meeting of the Missouri Veterinary Medical Association, Sedalia, June 25-27, 1929.

No two agreed on anything. One would illustrate the condition in his part of the country by describing history, symptoms, lesions and death rate. Another would remark that was an entirely different condition than what he was dealing with in his community.

Notwithstanding the confusion that resulted much good grew out of these discussions. It got every veterinarian to thinking about swine diseases and stimulated a desire to learn more about them. With the results today swine are getting the best expert attention available. It is a credit to the veterinary profession the way they are mastering the situation that existed in the swine industry. Some of the principles responsible for advancement in swine disease diagnosis may be enumerated as follows:

1. Reviewing the anatomy and physiology which gives a very vivid picture as to the contour and construction of the body, low to the ground usually carrying a large amount of adipose tissues with very small respiratory organs compared to their body weight. This would naturally make a hog quite susceptible to lung and other infections, especially so as a complication.

2. Studying the nature and habits of the hog and the condition under which they are kept. By nature they root in the ground for minerals and vegetable material which facilitates the inhalation of bacteria existing in the soil. Further, they are always housed in multiple numbers causing close contact with one another during their entire life. Hog lots quite uniformly are kept alike as to sanitation and surroundings. Variation may often be found in feeding usually depending on localities as to the most available and cheapest foods.

3. The history of the herd should be thoroughly gone into. Frequently hogs that you are called upon to treat, have not been raised on the premises but originate in some other part of the country and were trucked or shipped in by rail. On some farms hog trouble seems to occur yearly. Often hogs have been treated before you are called, sometimes making it rather difficult to get the correct information.

4. The symptoms described in text books and bulletins and articles copied from them under the caption of hog cholera such as rising temperature, body in-coordination, discoloration of the skin, drooping of tail, sniffling, cough, inappetence, conjunctivitis, sloughing of the skin, constipation and diarrhea are now acknowledged present in many other swine disorders.

5. Pathological lesions such as petechia, ecchymosis and hemorrhages which formerly were thought to be pathognomonic of hog cholera are found to be common to all swine septicemias, such as hog cholera, hemorrhagic septicemia or swine plague, swine erysipelas, Bacillus suipestifer infection and perhaps other diseases up to this time not recognized. All these lesions may also be found in such conditions as toxemia, suffocation, strangulation, and various respiratory and digestive disturbances. Often pathological lesions found in swine are not the results of the primary specific disease, but rather due to a secondary infection—complications. Swine suffering from almost any disorder for any length of time which terminates in death, on post-mortem examination may show a series of pathological changes, that are most difficult to analyze. Many saprophitic organisms including both aerobes and anaerobes which are harmless when taken into the body while in perfect health, apparently have pathogenic influences in the organism weakened by a specific infection.

In the final analysis, it may be said the diagnosis of swine diseases requires a basic scientific veterinary education, with a great deal of thought and continued study. Every phase must be taken into consideration. Interpretations and deductions must be made before a final decision is made. In view of the fact that the veterinarian must have a thorough knowledge of all that has been discussed in this paper and a great deal more which is to be gained through years of diligent study, we sometimes wonder whether such men have their fellow-man's interest at heart that put themselves out as being capable of diagnosing swine disease without a fundamental veterinary training.

FOXES AND PARACITISMS

In the July issue of VETERINARY MEDICINE I was very much interested in the observations of E. Mitscher, "who raises silver foxes himself and who describes the habits of wild foxes." (Page 295.)

Being as much, if not more, of a naturalist than a veterinarian, Mr. Mitscher's observations upset some of my most cherished beliefs in regard to the diet and habits of foxes. Whether it is that I lack the mental simplicity to swallow these facts without question or that I hate to admit that I have been deluded all these years, are questions which I leave to your discretion. Somehow or other, this "bolus of information" simply will not go down.

The article goes on to state that "foxes are not like cats and sables (why sables particularly?), but rather scavengers, disposing and living off the remnants of carcasses left by these animals." Now I am rather afraid that this statement is likely to start a controversy between the lovers of cats and dogs. Seeing that the fox is a near cousin to the dog, I can hardly imagine friends of the canine race meekly submitting to the fact that one of its members is in the habit of tagging after the more humble cat for a living. I will admit that I have seen dogs following cats, sometimes at a rather high rate of speed, but I have always felt that this was not entirely for the purpose of licking up the remnants of kitty's milk.

Being rather curious to know the actual diet of wild foxes, I have taken the trouble to consult the works of several noted mammologists and find that Reynard has rather a varied menu consisting of rabbits, hares, mice, ground hogs, partridges, quail, lizards, frogs, crayfish, crabs, insects, particularly grasshoppers, and at times vegetable foods such as grapes, wild berries, fungi, etc. In no case could I find any reference to foxes eating carrion or dead meat, but it *is* possible that they might have to resort to such foods to ward off starvation in case of dire necessity. Yes, I was about to mention chickens. I'll just bet that I could go out into almost any fox country and select half a dozen or more farmers or their wives who would agree with me that foxes do occasionally kill and eat chickens.

Mr. Mitscher goes on to state that "bulky foods, especially a great amount of lime from bones, render conditions in the intestinal tract unfavorable for the development of worms." I have no doubt that the viscera and the glandular portions of animals killed and eaten by foxes are of benefit in providind vitamin and mineral elements necessary for the proper functioning of the body. However, I am rather skeptical as to the anthelmintic value of fur, feathers, bone, tendons or other bulky foods, and I shall continue to be skeptical until I find sufficient scientific evidence to the contrary. If there is anything in this, I would think it would be an excellent idea for some enterprising manufacturer "to put out" a "bulk" worm remedy suggesting the use of such products as excelsior, wood chips, straw, corn stalks and other bulky foods as constituents. These should be reasonably cheap and by no means hard to obtain.

The fact that "grabs my caprine complacency" is that Mr. Mitscher informs us that "wild foxes suffer less from worms than animals raised in captivity." I presume he wishes to infer that this is also due to the bulky nature of the food of the wild animal. In consideration of our present knowledge of the propagation and spread of intestinal parasites, why shouldn't foxes raised in pens be more heavily infested with worms than foxes in a state of nature, who more rarely come in contact with opportunities for infestation. To assume that the freedom from intestinal worms in foxes raised in captivity is due to the nature of their diet is certainly not in agreement with modern opinion. It is a well known fact that wild animals are sometimes found to be infested with intestinal worms. They appear to be susceptible enough if exposed to infestation but their wide range goes a long way toward keeping them free from heavy parasitism.

In conclusion, and to be as charitable as possible, it is my personal opinion that Mr. Mitscher is just "slightly damp."

G. W. Rawson.

Detroit, Michigan.

THE USE OF BACTERINS IN MASTITIS*

To the man engaged in cattle practice, diseases of the mammary gland are of first importance, and of these mastitis heads the list. As with diseases of the respiratory system, so, too, with the lacteal organ—bacteriological classification is still far from being perfect. Out of the haze, however, and gathered from considerable experience in the matter I would suggest the following classification:

1. *The parenchymatous* type, usually seen in dry cows, and heifers at grass, the organisms present being the *Bacillus bovisepticus, Bacillus coli communis* and occasionally *Streptococcus pyogenes* and *Bacillus pyocyaneus.* The secretion here is foul-smelling, watery at first, then purulent, and grey or green in color.

2. *The catarrhal form,* usually seen in cows in full milk, is caused by the streptococcus and *Agalactus longus, Brucella abortus, staphylococci* and *Bacillus coli communis.*

Owing to the number of pathogenic organisms engaged in these attacks, it is obvious that stock vaccines in mastitis are of uncertain value. Further, where active bacterial aggression has taken place, the udder is the most ideal organ for germinal activity, the organ, of itself, being an ideal incubator, supplying heat, moisture and nourishment to perfection. Can it be wondered at, then, that in a bacterial attack the germs soon run riot and, further, owing to the small canals and *culs de sac,* bacterial housing is almost perfect, which, on small consideration, points to the futility of mammary injections with antiseptics. It must be conceded, therefore, that curative measures have their limitations, and that prophylaxis is, in the end, the more economical.

Where an outbreak occurs in a herd, a sample should be taken from each affected cow, bacteriologically examined and cultures made. I then inject the bacterin into each healthy cow, beginning with a minimum dose and increasing it weekly, giving three injections in all. Cuti-vaccination should also be practiced. If curative measures are called for, in isolated cases, I prefer to begin by giving sera and then sera and vaccines, coupled, of course, with the usual local and systemic palliative measures.

Edinburgh, Scotland. W. Scott.

* From *The Veterinary Record,* Vol. IX, No. 22.

CHANNELS OF ADMINISTRATION FOR BACTERINS*

The usual method of administering bacterins is by subcutaneous injection, while some prefer the intramuscular route. Recently intradermal injections in selected cases have been advised, and I have practiced skin scarification (cuti-vaccination) for some years with good results. This latter observation is based upon the researches of Besredka, who brought to light a new conception of the mechanism of infection, and the nature of immunity on the part of the skin. He showed that if a virulent culture of anthrax was rubbed into the shaved skin of a guinea-pig the animal died in three or four days, but if an attenuated culture was used the animal became ill, but lived and, further, a considerable degree of immunity was acquired, for it would now survive the application of a virulent culture. It was further proved, and this is of practical importance, that the skin became immune all over the body, the local immunity appearing to radiate throughout the whole cutaneous structure. It was also proved that the skin is the channel of infection in all anthrax cases, and as the mucous membrane is the inward continuation of the skin the same condition obtains here also. These observations were extended to other bacteria affecting the skin and mucosæ and the same conclusions were arrived at. It will be gathered, therefore, that in cuti-mucosal infections cutaneous vaccination is a valuable asset in the immunizing role.

Edinburgh, Scotland. W. Scott.

* From *The Veterinary Record,* London, Vol. IX, No. 22.

BIOLOGIC TREATMENT REQUIRES ADJUVANTS*

I find that among some practitioners there is an ingrained idea, in connection with the use of sera or bacterins, that if they inject a suitable biological product into their patient it, and nature, will do the rest. In other words, masterly inactivity is their motto and motive. Now this is all wrong: vaccine therapy is a most valuable asset in skilled hands, but he who thinks it a miracle worker, I fear, will be sadly disappointed.

The following examples will illustrate my point:

Take an animal suffering from an old-standing, discharging wound, such as fistula of the poll or withers. As a result of a long-standing bacterial warfare the surrounding tissue cells are activated, and a pronounced fibrosis follows, while the walls of the sinus have become indurated. In such a case it is impossible for the bacteriotropic serum to filter through or the scavenging phagocytes to reach the infective foci. Clearly, in such a case, surgery must go hand in hand with the vaccine treatment, by a free use of the curette and lancet. Again, drainage is of first importance, for pus has a powerful tryptic action and, if not removed, burrows into healthy tissue, extending the diseased area.

Further, be it remembered, pus is an inflammatory by-product, dead and useless, and hence must be removed if the surrounding tissues are going to be restored to normal. Drainage is, therefore, imperative, and that vaccine therapy cannot accomplish.

Or take a condition where there is a deep bacterial involvement and consequent toxæmia; putrefactive and fermentive changes take place in the intestines, which irritate the mucosæ and set up diarrhea, which is really Nature's effort to rid the bowel of an irritant, and which, if the practitioner is thoughtful, he will have foreseen by administrating a laxative followed by intestinal antiseptics, of which there are none better than the sulphocarbonates and small doses of calomel.

Still further to reduce the auto-intoxication, the skin and kidneys require careful attention, and here diaphoretics and diuretics are indicated.

Or take a case of pneumonia, where the blood vessels of the lungs are gorged to bursting point; where oxygen starvation is reached, where the right heart is blocked with impure blood, and the left is tired out by pumping blood at well-nigh coagulation point under pressure. In such a case one must keep the heart going by tonics and stimulants by administering vasodilators and by retarding coagulation with decalcifying agents.

Edinburgh, Scotland. W. Scott.

* From *The Veterinary Record*, London, Vol. IX, No. 22.

POSSIBLY PHARYNGITIS

Will you kindly let me know if any of your readers have had the same experience as I have had on about half a dozen cases during my fifteen years of practice. About three weeks ago I was called to see a black horse, eight years old, weighing 1,200 pounds. This horse could not swallow any hay. He would eat bran and oats scalded or or mixed up wet. The wet feed was about all he lived on for nine days. I made several visits to this horse.

On the first visit, I dressed his teeth, which were in bad shape. This did not make any difference to his eating. This horse would pick up a mouthful of hay, chew it for several minutes, try to grind it and would grind it up fairly well, then drop it from the mouth and take another mouthful and do the same thing.

This case was very puzzling to me as this animal was certainly doing his best to get some hay. His temperature was normal, pulse normal and he seemed quite normal in every respect with one exception. That is he had some discharge from the nose for a few days.

He would drink some water but not his usual amount.

Treatment: I used potassium chlorate in the drinking water, gave a dose of linseed oil and applied mustard plaster to throat.

On the ninth day he started to eat hay and has been doing fine ever since. He had got very thin and in fact so thin he could scarcely stand or walk.

Any information that other practitioners will give me gleaned from their experience with such cases will be greatly appreciated. My diagnosis has always been some form of sore throat.—C. A. K., Ontario.

TEN ECONOMIC REASONS FOR TUBERCULOSIS ERADICATION

1. Tuberculosis eradication aids in sale of purebred cattle.
2. Cast-off dairy animals bring better prices.
3. Losses by death due to tuberculosis stop after herds are placed under test.
4. Area eradication work promotes the sale of surplus cattle.
5. Area eradication work fosters better dairy husbandry.
6. Farmers in the Corn Belt and adjoining States receive large premiums from swine from modified areas.
7. The eradication work helps to establish better markets for milk.
8. The systematic way in which the work is conducted attracts the interest of bankers and others interested in the cattle industry.
9. The interstate movement of officially tested cattle is facilitated.
10. Testing of cattle promotes control and eradication of avian tuberculosis.

Cattle infected with tuberculosis reaching the public abattoirs decreased from more than 2 per cent in 1917 to 1 per cent in 1928. Tuberculous swine are also decreasing.

SARCOPTIC MANGE SPREAD SLOWLY

A big chestnut horse, in good condition, was suffering from bad canker of both hind feet. As the case was likely to be a long one, I had him put into a stall between two other animals—one a horse and the other a mule, which were also likely to be under treatment some time, owing to foot injuries.

Both these animals were suffering from bad sarcoptic mange (proved by microscope). The partition between the stalls was simply a swinging bar. No skin dressing was applied. I had these three animals groomed with the same brush for thirty days and at the end of that time the disease was not conveyed to the horse with a healthy skin, i. e., from a clinical point of view, nor was the coat in any way itchy.

I might add that the chestnut horse received 60 grains of arsenic daily in his food and showed no poisonous symptoms.

The canker did not improve, nor did it become much worse.—Lieut. Col. H. T. Ryan, Cork, Ireland, in *The Veterinary Record,* Vol. IX, No. 23.

METHOD FOR DIRECT IODIZING

In some experimental work at this station, the iodizing of milk has been tried not by feeding iodin containing substances to cows, but by adding directly to milk molecular iodin in the form of Colliodal Iodin Chandler. The iodin is in suspension in water, which is a desirable factor, and is very active chemically. This form of iodin has been administered in one ounce doses of 2% and 4% concentrations directly into the gizzard of hundreds of thousands of chickens for the successful treatment of worms. The chickens suffer no ill effects. According to some experimental work being conducted at the Alabama Polytechnic Institute, Auburn, Alabama, chickens are not thrown off egg production but actually show an increase after being treated. In some unpublished work of W. L. Chandler of this station, three ounce doses of a 2% colloidal iodin (approximately 1.5 grams of iodin) have been administered to sheep in a treatment against parasites, the iodin had no apparent harmful effects on the sheep.

If it is found desirable to use milk as a carrier for iodin, the colloidal form of it can be added directly to the milk in any quantity desired. It is unnecessary to resort to any questionable and tedious means of getting the iodin into the milk and to a chemical analysis to ascertain the quantity present or whether any is present. Iodin in this form combines

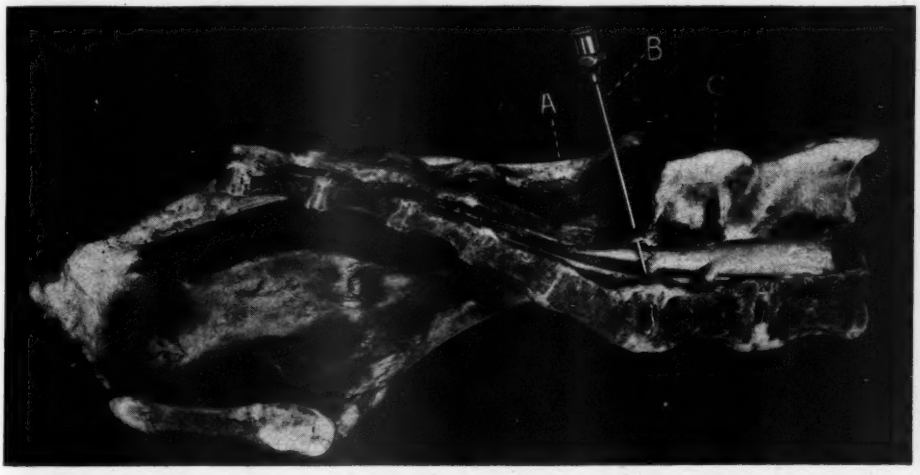
readily with the milk proteins and unsaturated fatty acids. Within 20 to 30 seconds after adding sufficient iodin to milk to make 100 parts per million, the brown coloration disappears and the milk is again normal in color. The taste of the milk is unaltered up to concentrations as high as 90 to 100 parts per million of iodin, which is a great excess for dietary purposes; and, as the milk ages and sours, no abnormal taste develops. In the light of further knowledge about colloidal iodin, probably, therapeutic doses of it can be administered in milk under a physician's guidance. This form of iodin, because of its great germicidal power, offers some interesting problems in the production of a sterile milk for bacteriological and therapeutic purposes.—*Michigan Quarterly Bulletin.*

INJECTION FOR EPIDURAL ANESTHESIA IN SWINE

Epidural anesthesia in the hog is accomplished by passing the needle through the interspace between the last lumbar vertebrae and the sacrum and injecting the anesthetic solution outside the dura mater. The point to insert the needle is located by first drawing an imaginary line across from the anterior borders of the wings of the ilium, then at a point approximately two and one-half inches posterior to this line and exactly in the median plane insert the needle in a downward and forward direction. The depth the needle will have to be inserted will depend upon the condition of the animal. For a 40-pound pig in good condition the distance will be approximately one and one-half inches and it may be necessary to insert it four inches in a large hog.

Needle in position to inject the solution.

This form of anesthesia has been used in operations for the relief of scirrhous cord, scrotal hernia, monorchidism, umbilical hernia, removal of large growths, and in young gilts for cesarean section.



Anatomical structures involved. A, sacrum; B, needle; C, last lumbar vertebra.

Manhattan, Kan. E. R. Frank.

KANSAS CITY SAVES BY ANTI-RABIES VACCINATION

During my four years' service in the Kansas City Health Department, ending in February 1927, the prevalence of rabies in dogs steadily increased and the gratis anti-rabic treatment of humans in the out-patient clinic of the General Hospital became alarming.

For this reason, an ordinance providing for compulsory vaccination of dogs was enacted by the city council.

Anti-rabies vaccination of dogs is required before a license is issued. The vaccination may be obtained free of charge at the city clinic or may be given by a qualified veterinarian. Either certificate is acceptable by the Dog Enumerator's Office.

This vaccination was started at the city clinic January 27, 1927, the number of dogs vaccinated being as follows:

1927		1928	
January	1,150	January	265
February	7,822	February	286
March	2,757	March	419
April	2,258		
May	740	Total Vaccinated	18,994
June	616		
July	408		
August	739		
September	532		
October	466		
November	294		
December	242		

The dog enumerator lists over 26,000 dogs, so the private veterinary practitioners have immunized some 7,000 or 8,000 dogs. The dog licenses are not due until June 1st of each year, and for this reason, the number of dogs vaccinated per month is greatly increased in April and May.

The laboratory report on brains examined and the anti-rabic treatment of exposed humans are interesting. The city does not treat any except residents within the city limits and only those where the city laboratory has made a positive diagnosis, of the brain of the animal to which the victim was exposed.

LABORATORY REPORT

	1926					
	Dog			Cat		
	x	—	u	x	—	u
January	4	..	..	1	..	..
February	10	3	1	..	1	..
March	9	7	..	..	2	..
April	10	3	..	..	..	..
May	14	8	1	1	2	..
June	14	3	1	..	..	..
July	13	4	2	..	4	..
August	5	8	1	1	1	..
September	8	4	1	1	1	..
October	7	6	1	..	..	..
November	6	4	..	..	1	..
December	7	4	..	..	2	..
Totals	107	54	8	4	14	..

	1927						1928		
	Dog			Cat			Dog		
	x	—	u	x	—	u	x	—	u
Jan.	9	2	1	..	..	..	1	1	..
Feb.	19	7	2	1	1	..	..	1	..
Mar.	7	7	..	3	1	..	1	1	..
April	7	3	..	..	..	..	..	..	..
May	9	10	1	1	1	..	..	..	..
June	1	7	..	..	3	..	..	..	..
July	..	10	4	..	..	..	..	..	..
Aug.	7	3	3	..	1	..	..	..	..
Sept.	2	4	2	..	2	..	..	..	..
Oct.	..	5	1	..	..	..	..	..	..
Nov.	2	1	..	..	..	..	..	..	..
Dec.	3	4	..	..	..	..	..	..	..
Ttls.	66	63	14	5	9	..	2	3	..

Note: x = Positive negri bodies, — = Negative, u = Brain unfit for examination.

In 1926 there were twice as many positive as negative and in 1927 the percentage was perceptibly decreased. Likewise it will be noted the number of positive cases decreased from 10 in February 1926 and 20 in 1927 to none in February 1928.

Report of the out-patient department of the General Hospital on persons receiving anti-rabic treatment:

	1925	1926	1927	1928
January	12	26	25	4
February	16	28	18	1
March	19	26	26	7
April	14	26	11	—
May	22	39	12	12
June	21	28	10	
July	32	38	7	
August	42	29	8	
September	21	37	6	
October	30	21	2	
November	30	8	1	
December	21	25	6	
Totals	280	331	132	

In talking with the Health Commissioner, Dr. E. W. Caveness, he estimated

the minimum cost of anti-rabic treatment at $20.00 per person. If the percentage decrease in 1928 corresponds to that of 1927, there will be a significant saving in money to the city, not considering the life jeopardy. The cost of maintenance of the dog prophylactic clinic is estimated at $6,500.00 a year. This furnishes the vaccine, salary, rent and car mileage.

The Health Commissioner is quoted under date of May 10, 1928, as follows:

"Our Department of Inspection and Sanitation, in cooperation with the laboratory and veterinary department, have recently completed a study or re-check and it is their opinion that the single injection method of rabies prophylaxis in dogs is very successful and the cases of rabies developing in animals after treatment, are practically unknown to this department. We have two reported cases but in each of these cases, the dog had been exposed before vaccination.

"The results of the single injection method are indeed gratifying and an important feature is, not until May or June of this year (1928) did the vaccine used, contain but 0.5 gram brain and cord tissue per dose, which goes to show that the amount of brain substance is not so important as the certainty of the fixed virus used, although I note that recently the Bureau suggests 1.0 gram per dose or 20% brain and cord."

Kansas City, Mo. John J. Glover.

VACCINATION LESSENS RABIES IN TULSA

Late in 1925 and early in 1926, Tulsa began enforcing the rabies vaccination ordinance. The first year, as I recall it, I vaccinated some 2,000 dogs.

During this period we observed three cases of rabies in dogs that had received the immunizing treatment, and three cases in dogs that had not been vaccinated.

We consider this a very remarkable record, owing to the fact that before this treatment was started here in Tulsa, we would observe on an average of three to five cases of rabies here at the hospital each week.

Within this 12-month period I judge there were some 6,000 dogs vaccinated by myself and other veterinarians in the city, leaving from 500 to 1,000 dogs unvaccinated.

During 1927 the ordinance wasn't enforced to the same extent, and we had some 30 cases of rabies that year, mostly in unvaccinated dogs.

This year (1928) the ordinance was enforced somewhat better than last year, and we have noticed fewer cases of rabies.

It is my opinion that if we could have nation wide anti-rabies vaccination of dogs with rigid quarantine for those imported from other countries, we could in a short time, eliminate this dread disease from the whole country.

Tulsa, Oklahoma. C. R. Walter.

Tait Butler, 1901

C. J. Marshall, 1915

Geo. H. Glover, 1911

Wm. Herbert Lowe, 1906

Former Presidents of the American Veterinary Medical Association

CHANGES IN ARMY VETERINARY SERVICE

Regular Army

Colonel Ray J. Stanclift is relieved from duty at Fort Sam Houston, Tex., effective on or about August 10, 1929, and assigned to Fort Riley, Kans., for duty.

Lt. Colonel Robert C. Musser is relieved from duty at the Army Veterinary School, effective on or about August 1, 1929, and assigned to duty at the Chicago general depot, Chicago, Ill.

Lt. Colonel A. L. Mason is relieved from duty at Fort Bliss, Tex., effective on or about August 10, 1929, and directed to report for duty at Fort Sam Houston, Texas.

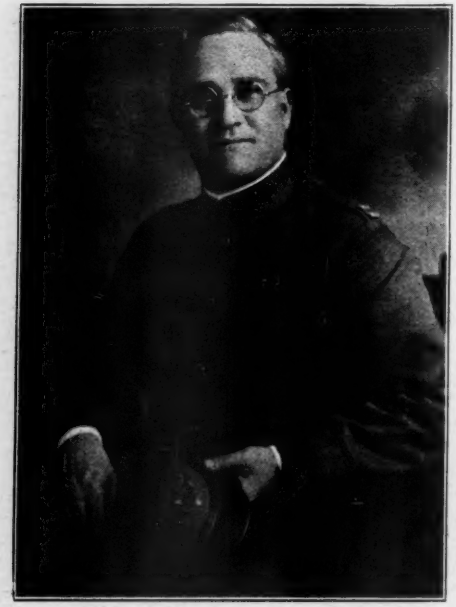
Orders directing Captain John R. Ludwigs to report to the Army Veterinary School for duty as student have been revoked.

Captain Mott Ramsey is relieved from duty at Fort Ringgold, Tex., and assigned to Fort Sam Houston, Tex., for duty.

Captain Josiah W. Worthington is relieved from further duty at Fort Sam Houston, Tex., effective on or about August 15, 1929, and assigned to Madison Barracks, New York, for duty.

Captain Ralph B. Stewart is relieved from further duty at Fort Riley, Kans., effective on or about July 15, 1929, and assigned to duty at Carlisle Barracks, Pa.

Captain Irby R. Pollard is relieved from further duty at Carlisle Barracks, Pa., effective on or about July 15, 1929, and directed to report to the commanding officer, Quartermaster Depot, Fort Robinson, Nebr., for duty.



Major George H. Koon, the New Commandant of the Army Veterinary School, Washington, D. C.

Orders relieving Captain Frank C. Hershberger from duty as transport veterinarian on the U. S. transport "Meigs," and from further duty at Fort Mason, Calif., effective on or about July 5, 1929, are amended so as to relieve him on or about September 6, 1929.

Captain Claude F. Cox is relieved from duty at Fort Sam Houston, Tex., effective on or about July 1, 1929, and assigned to duty at Fort Hoyle, Md., for duty.

Major George H. Koon is relieved from duty at Fort Leavenworth, Kans., and assigned to duty as commandant of the Army Veterinary School, Army Medical Center, effective on or about August 10, 1929.

The retirement of Colonel Robert Vans Agnew from active service on May 28, 1929, for age, is announced.

Veterinary Reserve Corps

Promotions:

Conroy, James Gibbons, Walkersville, Md., to Major.

Denman, Clarence B., 273 Hudson Ave., Newark, O., to Captain.

Goodman, Albert A., Norwood, Colo., to Captain.

Harbaugh, Fred G. Lubbock, Texas., to 1st Lieutenant.

Rundle, Thomas T., Camarillo, Calif., to Major.

New acceptances:

Adamson, Cecil Temple, 2nd Lieut., Centerville, Iowa.

Bailey, William W., 2nd Lieut., Red Lodge, Mont.

Barry, James R., 2nd Lieut., Norwalk, Wis.

Bark, Hurdman W., 2nd Lieut., Sandwich, Ill.

Beretta, Edward H., 2nd Lieut., Red Lodge, Mont.

Bolin, F. M., 2nd Lieut., Route No. 4, Carthage, Mo.

Carter, George S., 2nd Lieut., 3008 West St., Ames, Ia.

Lewis, Henry Vance, 2nd Lieut., Edgewood, Iowa.

Johnson, Percy Carl, 2nd Lieut., Cannon Falls, Minn.

McCauley, Earl Dale, 2nd Lieut., Lake Park, Iowa.

Mericle, Robert Bruce, 2nd Lieut., Blue Earth, Minn.

McClung, Hugh Edward, 2nd Lieut., Route No. 3, Hayward, Calif.

De Camp, Daniel, 2nd Lieut., Woodbine, Kansas.

Mohri, Ralph Wm., 2nd Lieut., Manhattan, Kans.

Moore, Needham Branch, 2nd Lieut., Kinston, N. C.

Omer, Charles Robert, 2nd Lieut., Mankato, Kansas.

Thom, Edwin G., Captain, Kenosha, Wis.

Transferred to Auxiliary Reserve June 20, 1929, Lt. Colonel Levi Enos Day.